JPRS 78271

11 June 1981

USSR Report

EARTH SCIENCES

No. 15

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METEOROLOGY

NOTES ON SOVIET WEATHER FORECASTING

Moscow KRASNAYA ZVEZDA in Russian 22 Mar 81 p 4

[Article by A. Vasil'yev, deputy director USSR Hydrometeorological Center: "A Service Necessary to All"]

[Excerpts] Specialists of the USSR Hydrometeorological Center prepare and each day issue an enormous quantity of what we call prognostic production. It is understandable that a high operational level and quality of forecasts cannot be achieved without having a modern material-technical base. And we have it. The specialists of the Hydrometeorological Center have electronic computers capable of carrying out up to 1.5 million operations per second, automatic print-out and drafting devices and high-speed electric communications. The Hydrometeorological Center several times a day receives the results of observations of the state of the atmosphere. These are sent by synoptic and aerological stations, ships at sea and scheduled airliners, artificial earth satellites and radars. The observational data are automatically decoded, checked and analyzed and then electronic computers are used in making computations of prognostic charts of the fields of meteorological elements for different levels in the atmosphere for a time up to five days. On the basis of these charts, using special methods, on-duty specialists prepare the weather forecasts.

The probable success of the forecasts is evaluated for checking the quality of the forecasts. The situation is the best with respect to weather forecasts for 24 hours. (on the average, about 86% probable success) and for three days (about 84%). With an increase in the advance time of the forecasts their probable success decreases. This is attributable, primarily, to the poor degree of study of the atmosphere and the processes occurring in it. Bringing about an increase in the success of the forecasts, especially long-range forecasts, is a complex and highly responsible task on whose solution we are constantly working.

The meteorologists of our country clearly understand that despite the successes attained there is still much to be done in order to improve the quality of forecasts and increase their probable success in order to satisfy more fully the requirements imposed on the weather service by tne most different branches of the national economy. The solution of these problems is being sought in two directions: improvement in the forecasting method and bringing about further automation of all work. Here an important role will undoubtedly be played by an increase in scientific information, especially that obtained in space investigations.

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CSO: 1865/176

UDC 551.510.535.2:551.55

MACROSCALE INHOMOGENEITIES IN THE WIND FIELD AT ALTITUDES 80-100 km

Moscow IZVESTIYA AKADEMII NAUK SSSR: FIZIKA ATMOSFERY I OKEANA in Russian
Vol 17, No 3, Mar 81 pp 236-242

PORTNYAGIN, Yu. I., Institute of Experimental Meteorology, manuscript received 23 Apr 79, after revision 10 Jan 80

[Abstract] The author estimates the characteristic spatial scales of fluctuations of parameters of the wind regime at altitudes 80-100 km during the period of spring restructuring of circulation on the basis of data from synchronous radiometeor observations at two stations, Obninsk and Volgograd, carried out at the Institute of Experimental Meteorology. On the basis of these radar observations of drifting meteor trails in March-April 1977 it was possible to evaluate the scales of the inhomogeneities in the field of the prevailing and tidal wind at these altitudes, associated with fluctuations of wind velocities with periods of several days. It is shown that for the zonal component of the prevailing wind the characteristic spatial scale is close to 2,500 km and for the meridional component it is 1,500 km. The nature of the temporal variation of fluctuations of the prevailing wind and the parameters of the semidiurnal tide is substantially different. The spatial scales of fluctuations of parameters of the semidiurnal tide for the zonal and meridional components are virtually identical and are close to 1,500 km. Figures 5, tables 1; references 11: 5 Russian, 6 Western.
[137-5303]

UDC 551.501.71:551.510.534

JOINT USE OF MEASUREMENTS OF OUTGOING UV AND IR RADIATIONS FOR RESTORING THE VERTICAL PROFILE AND TOTAL CONTENT OF OZONE

Moscow IZVESTIYA AKADEMII NAUK SSSR: FIZIKA ATMOSFERY I OKEANA in Russian
Vol 17, No 3, Mar 81 pp 266-272

TIMOFEYEV, Yu. M. and BIRYULINA, M. S., Leningrad State University, manuscript received 10 Dec 79, after revision 4 Jul 80

[Abstract] The article gives an analysis of the possibility of a joint satellite experiment for measurements of outgoing radiation in the ozone absorption bands in the UV and IR spectral ranges. It is demonstrated that measurements in the two

ranges yield large volumes of independent information on the vertical structure of atmospheric ozone content. The accuracy in determining the characteristics of ozone content in the interpretation of the joint measurements was appreciably higher than the accuracy of traditional methods. The high information yield of the IR method relative to the ozone content in the lower stratosphere makes it possible to exclude long-wave UV measurement channels in the joint satellite experiment scheme without an appreciable loss of accuracy. This makes possible a substantial decrease in requirements on the accuracy in stipulation (or determination) of the aerosol optical state of the atmosphere. It is clear that a specialized satellite instrument can be created for measuring radiation in two spectral ranges in a single field of view and this will make it possible to obtain information on the vertical profile of ozone content in a broad range of altitudes from 10 to 60 km and the total ozone content with an accuracy appreciably exceeding the accuracy of individual IR and UV measurements. Figures 2, tables 1; references 11: 5 Russian, 6 Western.
[137-5303]

UDC 551.576:551.574.12

STATISTICAL CHARACTERISTICS OF THE VERTICAL STRUCTURE OF LIQUID-WATER CONTENT OF CUMULUS CLOUDS

Moscow IZVESTIYA AKADEMII NAUK SSSR: FIZIKA ATMOSFERY I OKEANA in Russian
Vol 17, No 3, Mar 81 pp 273-285

MALKEVICH, M. S., KOSOLAPOV, V. S. and SKATSKIY, V. I., Institute of Oceanology and Institute of Applied Geophysics, manuscript received 5 Feb 80

[Abstract] The basic objective of the authors was obtaining reliable a priori information which could be used in solving the inverse problem of determining the vertical profiles of liquid-water content of clouds by the statistical regularization method. This involved the statistical processing of aircraft measurements of the profiles of liquid-water content in individual cumulus clouds of different thickness. For the cloud groups it was possible to obtain the mean profiles of liquid-water content, standard deviations, autocorrelation matrices, liquid-water deviations, eigenvalues and eigenvectors of these matrices. The correlation between variations of some cloud parameters and variations of liquid-water content at different levels is analyzed. The cited examples indicate that a system of eigenvectors ensures the possibility of an extremely economical description of the vertical profiles of liquid-water content of cumulus clouds. These same systems can be used as a priori information in solving inverse problems in determining the vertical profiles of liquid-water content from measurements of clouds in the centimeter range. Figures 2; tables 7; references 6: 5 Russian, 1 Western.
[137-5303]

SATELLITE STUDY OF DESERT AREA

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 1 Apr 81 p 2

[Abstract] The area over the Karagiye depression has been identified as a natural generator of rain clouds. This area is being studied from space from meteorological satellites. During the summer rain clouds are created in the form of a many-kilometer garland extending parallel to the shores of the Caspian. The results of the investigations will enable scientists to increase the accuracy of the precipitation forecasts for the desert area, and in addition, have demonstrated that the area is an ideal place for the artificial stimulation of precipitation.
[134-P]

EXPEDITION TO THE RED SEA

Moscow PRIRODA in Russian No 9, Sep 80 pp 25-36

[Article by A. S. Monin and V. S. Yastrebov]

[Excerpts]

Biographical Data on Authors

Andrey Sergeyevich Monin, corresponding member USSR Academy of Sciences, director of the Institute of Oceanology imeni P. P. Shirshov USSR Academy of Sciences. Specialist in the field of geophysical hydrodynamics. Author of investigations in different aspects of oceanology, atmospheric physics, planetary geophysics and the mechanics of fluid and gas. During recent years he has been intensively occupied with underwater investigations. Author of many books, including: ISTORIYA ZEMLI (History of the Earth), Moscow, 1977; ISTORIYA KLIMATA (History of Climate), Moscow, 1978. Together with Ye. G. Mirlin, in PRIRODA he published the article: "Study of the Floor of Lake Baykal Using Underwater Vehicles" (No 10, 1977).

Vyacheslav Semenovich Yastrebov, doctor of technical sciences, professor, deputy director of the same institute. A specialist in the field of technical apparatus for underwater investigations, underwater manned vehicles and deep-water robots. The author of a number of books, including: TELEUPRAVLYAYEMYYE PODVODNYYE APPARATY (Telecontrolled Underwater Vehicles), Moscow, 1973; PODVODNYYE ROBOTY (Underwater Robots), Moscow, 1977.

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Object of Investigations -- Red Sea Rift

Early in December 1979 three scientific research ships of the Institute of Oceanology USSR Academy of Sciences were sent into the Red Sea. These were the "Akademik Kurchatov," "Professor Shtokman" and the "Akvanavt." The objective of the expedition, which continued until 14 March 1980, was underwater investigations of the Red Sea-Aden Rift. The expedition received the brief designation "PIKAR" as an abbreviation of "Podvodnyye Issledovaniya Krasnomorsko-Adenskogo Rifta" (Underwater Investigations of the Red Sea-Aden Rift).

In order to compare all the rift system elements the participants in the expedition not only investigated the Red Sea Rift, but also carried out small expeditions in the Afars region (Ethiopia) and in the Aden Rift.

Outfitting of Expedition

Each of the ships of the "PIKAR" expedition had its own task and accordingly was outfitted with the necessary gear. The "Professor Shtokman," outfitted with narrow-ray echo sounders, apparatus for seismic profiling, magnetometers, temperature gradient meters, corers, dredges, etc., was the first to arrive in the southern part of the Red Sea for preliminary geomorphological and geophysical investigations. As a result of the work done at the very center of the rift it was possible to lay out two rectangular polygons -- outer, with a length of 15 km and a width of 55 km, with its center at the point 17°59'N, 40°06'E. and inner, with a length of 8 km and a width of 6 km, with its center at the point 17°57'N, 40°04'E.

Underwater vehicles, the manned "Paysis" and two unmanned telecontrolled vehicles, the "Zvuk-4m" and the "Zvuk-6," were to operate in the polygons. They arrived in the research area aboard the scientific research ship "Akademik Kurchatov" a week later. These vehicles were first tested in the region of the underwater Ampere seamount, located in the North Atlantic to the west of Gibraltar.

The "Akvanavt," joining the expedition after two days, was to carry out a detailed magnetic survey and work with unmanned telecontrolled vehicles, the "Zvuk-4" and "Manta-1.5."

The Institute of Oceanology has been carrying out investigations with underwater vehicles for several years. For example, the first major work of vehicles of the "Paysis" type, intended for submergence to a depth as great as 2 km, was an exploration (in 1977) of the bottom of Lake Baykal, constituting a sector of the continental rift, evidently being in a prespreading stage of rift formation greatly elongated in time (the age of the rift is about 20 million years). [A. S. Monin and Yu. G. Mirlin, "Study of the Bottom of Lake Baykal Using Underwater Vehicles," PRIRODA, No 10, 1977.] Incidentally, precisely after these investigations plans were laid for a study of the next stage in spreading in the Red Sea. Between the Baykal expedition and the "PIKAR" expedition the "Paysis" vehicles were used in carrying out investigations of the slopes of seamounts in the Pacific Ocean on the 21st voyage of the "Dmitriy Mendeleyev" in the autumn of 1978 and hydrophysical measurements of the vertical microstructure and turbulence in the Timor Sea on the 22d voyage of the "Dmitriy Mendeleyev" in the spring of 1979.

The unmanned telecontrolled vehicles "Zvuk-4," "Zvuk-4m" and "Zvuk-6" were outfitted with systems of the multiframe underwater photographic type, television systems (with image transmission through a cable to the ship and registry of the image on a video-magnetic recorder), acoustic profilographs and side-view sonars. On the telecontrolled vehicle with a "Manta-1.5" manipulator, in addition to a television system and an underwater photographic system there are screw engines which enable the vehicle, over a long period of time, to hover over the bottom and rest on the investigated object. Telecontrolled vehicles already have successfully participated in a number of expeditions in the Mediterranean Sea and in the Pacific Ocean.

Such outfitting of the expedition made possible an almost continuous observation of the floor of the Red Sea. The "Paysis" 29 times plunged into the sea, where it spent more than 163 hours under water (including 97 hours on the bottom). During this time there was registry of video-magnetic recorder films with a duration of 12 hours, a total of 666 underwater photographs were taken and 59 samples of rocks were taken (primarily of basaltic lavas) with a total weight of more than a ton; hydrophysical parameters were registered on 20 runs and 11 water samples were taken.

More than 30 submergences of unmanned underwater vehicles were carried out, during which about 3,000 bottom photographs were taken, videofilms with a duration of [illegible] hours were recorded, etc.

All the underwater vehicles passed a distance of 164 km over the bottom, more than 3,500 photographs were taken and videorecords of television films for 17 hours were obtained.

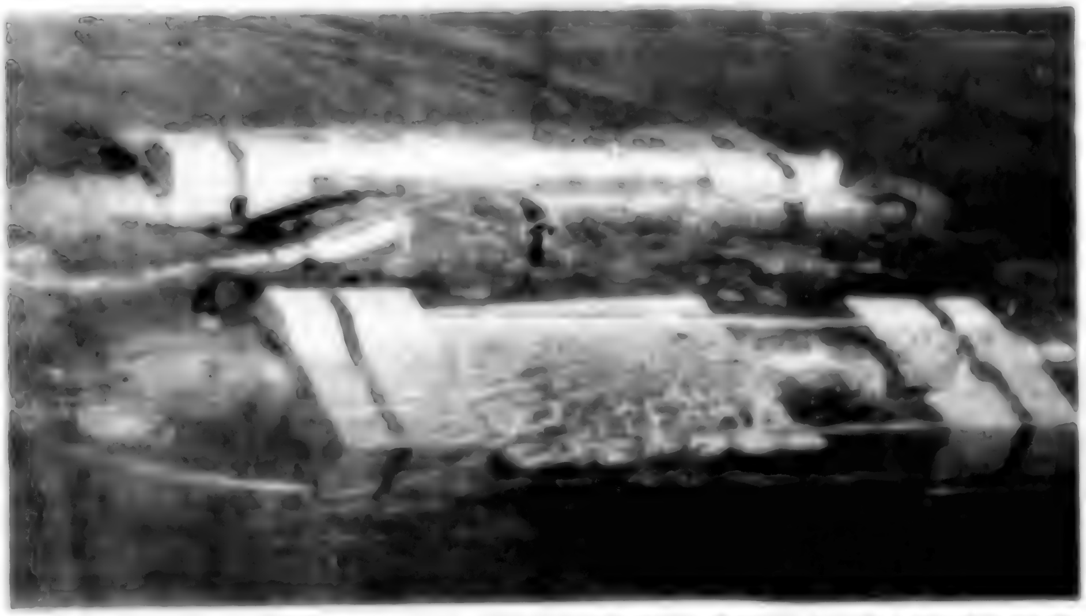
The enumerated materials, together with data from ordinary geomorphological and geological-geophysical investigations, made it possible to form a rather detailed idea concerning the structure of the Red Sea Rift in the example of its typical segment at a latitude of 18°N.

The step is followed by a rather gentle slope (with a steepness 12-14°), representing the continental slope. The slope runs for a distance of 20-25 km from the axis of the rift and is situated at a depth from 600 to 1200 m. The age of the continental slope, according to paleomagnetic data, is 2-3 million years. This slope is covered with sediments and has a step-like structure; locally in its lower part there are series of vertical scarps with a height as much as 10-20 m, where bedrock emerges at the surface. Evaporites could not be detected here during submergences of the "Paysis" and "Zvuk-4m," and also during dredging. Below the upper slope there is an intermediate step, evidently made up of a crust of the oceanic type. This is indicated by data from magnetic and gravimetric measurements, and also by spherulitic lavas, discovered here by the "Paysis," forming during contact betwee the outpouring lavas and the water, characteristic of a crust of precisely this type.

Numerous observations from the "Paysis," and also biological samples taken by the "Akademik Kurchatov," indicated that the bottom of the Red Sea Rift is exceedingly poor in benthos, whose biomass, according to the estimates made, does not exceed 0.05 g/m^2. Only individual small Polychaeta were discovered (true, in the rocks there were many small white tube worms, evidently of the Spirorbis genus), the bivalve mollusk Nukula. In two cases Actinia were discovered, in one case -- a glass sponge, from time to time -- hermit crabs, and also small craboids and small sea urchins. This poverty of deep-water benthos is attributable to the high temperatures of the bottom waters of the Red Sea (21-22°C) which are unusual for it and the evolutionary youth of the sea, so that the new species of benthos, adapting to these unusual conditions, have not yet succeeded in forming. However, bottom organisms were rather numerous: crustaceans of the decapod type and small amphipods, fragments of myctophids, brotulids, etc. As indicated by videorecords made with the "Manta-1.5," both in the bottom water and in the upper unconsolidated ground layer, there are eels and small deep-water sharks. Once from the "Paysis" it was possible to observe how an eel, twisting on the bottom and gradually turning about a vertical axis, left a light-colored stellate track on the reddish unconsolidated sand. Such tracks were often encountered by the "Paysis" observers.

Towed underwater vehicle "Tosela" in water. Photo by A. S. Monin.

Towed underwater vehicle of "Zvuk" type. Photo by V. S. Yastrebov.



"Manta-1.5" telecontrolled underwater vehicle. Photo by V. S. Yastrebov.

Submergence of "Zvuk." Photo by V. S. Yastrebov.

Submergence into Brine

During work in the Red Sea Rift special attention was devoted to investigation of the bottom of depressions with hot brines and metalliferous sediments. The "Professor Shtokman" took numerous samples of sediments from a number of depressions by means of corers. In the saddle between the Chain and Discovery depressions, at a depth of about 2 km, the "Zvuk-4m" vehicle obtained a series of photographs of [illegible] outcrops and a unique photograph of a mysterious two-dimensional ripple of decimeter scales, possibly on the brine surface. An ordinary underwater camera was used in taking photographs of the bottom with small-scale nonuniformities in the Atlantis and Valdivia depressions. Finally, unique dives of the "Paysis" were made into the Chain and Valdivia depressions with partial penetration into the hot brines.

A detailed study of the bottom was made in the first of these dives (to the record depth of 2050 m). It revealed a light yellow sediment with a slightly turbid black coloration with individual spots and hillocks, white as snow, which could be outcrops of evaporites. Along the bottom there were straight parallel ridges of sand waves with a length of 1.5-2 m and completely without the presence of tiny holes. It was easy to see the surface of a turbid brine, similar to the bottom, with a temperature of about 35°C and with a salinity of about 80°/oo, a speed of sound of 1615 m/sec with poorly expressed waves. In the saddle between the Chain and Discovery depressions the observers encountered a rocky wall of large angular rocks of a light yellow color. In the Valdivia depression, above the brine, amidst the sediments, there were rocky outcrops of light yellow and brownish rocks of the strata above the evaporites, almost everywhere covered by calcareous crusts. Some samples were taken there. "Small holes" were already encountered in the sediments several meters above the surface of the brine. It was also easy to see the surface of the brine (having a temperature of 23°C, an enormous salinity of about 280°/oo and a speed of sound 1645 m/sec), with underwater (internal) waves with surf on its shore. In an attempt to submerge into the brine the streams of heavy fluid flowed around the vehicle. This unique spectacle, for the first time observed by man, made a major impression on the participants in the descent.

Investigations in the Gulf of Aden were of great interest. The brief studies made in the Tadjoura Rift involved a detailed survey of the bottom relief of the selected sector of the rift (at the meridian of Aden) using a narrow-ray echo sounder carried by the "Professor Shtokman," hydrophysical measurements and phototelevision scanning of the rift slopes by the towed vehicle "Zvuk-4m." In contrast to the Red Sea Rift, here in the cross section of the Gulf of Aden there was clear expression of only a single scarp: the walls of the rift are at a distance of about 7 km from its axis. The depth differences are from 800 to 1300–1500 m and the steepness of the scarp is 15–20° or more. The bottom of the rift has subsided along the edges and is somewhat uplifted toward the axis, where pointed mountains with a height of 200–400 m, ridges and elongated blocks with steep stepped slopes are situated. A phototelevision scanning of the slopes revealed sectors covered with sediments with the same groups of small holes as in the Red Sea, numerous bedrock outcrops, and life near and at the bottom considerably richer than in the Red Sea.

Hydrophysical Measurements in the Red Sea

There was also an extensive program of hydrophysical and hydrochemical measurements on the "Akademik Kurchatov." On its voyage a total of 36 hydrological stations were occupied and about 200 soundings were made with a hydrophysical probe, including in two sections across the Red Sea and in four depressions with hot brines. In addition, "Fayvia" sensors measured the temperature and conductivity of the water, the speed of sound propagation in it and the concentration of dissolved oxygen. As a result, the expedition obtained new data on the hydrology of the Red Sea, and, in particular, on the vertical microstructure of the waters of the Red Sea in general and depressions with hot brines in particular.

The "PIKAR" expedition of the Institute of Oceanology of the USSR Academy of Sciences made it possible to obtain a number of unique results in a short time period. Its effectiveness was achieved by the use of several types of underwater vehicles at the same time.

The expedition once again revealed that the submergence of manned and unmanned underwater vehicles is an exceptionally productive method for the work of marine geologists who earlier had to lower dredges and corers blindly to the floor of the seas and oceans in the hope of acquiring samples of one sort or another. Now it is possible to work almost like on the land, move along the bottom surface in the necessary directions, inspect the bottom in detail, take photographs, obtain video-magnetic recorder films and take the needed samples with a manipulator. There is a great future for investigations of this type.

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CSO: 1865/158

NEW RESEARCH SHIP WITH LATEST EQUIPMENT PREPARES FOR MAIDEN VOYAGE

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 27 Feb 81 p 2

[Article by R. Motskus, Kaliningrad: "Ahead — the Vast Ocean"]

[Excerpts] Just a few days ago the ship Akademik Mstislav Keldysh, built at shipyards in Finland, tied up in Kaliningrad, its port of permanent registry. Immediately intensive work began on all eight of its decks; the new research ship of the USSR Academy of Sciences is preparing for its first cruise. The scientists are especially impatient for it. After all, the unique research equipment is one of the foremost qualities of this "floating institute."

"The scientific equipment accounts for almost half of the entire cost of the ship," V. Paka, director of the Atlantic Division of the Institute of Oceanology of the USSR Academy of Sciences, said. "It permits research by the most diverse specialists — hydrologists, meteorologists, geophysicists, geologists, and biologists. The scientists will have a deep-water probe that penetrates to a depth of 6.5 kilometers. Its sensors can determine the temperature, salinity, and density of the water, the concentration of oxygen dissolved in it, and turbidity indexes. The ship also has other towed instruments. The ocean floor can be studied using so-called bottom tubes and grapple-type devices. They are lowered to the bottom, pick up samples, and raise them to the surface. The complex of powerful electrohydraulic winches makes it possible to conduct these studies at any ocean depth. Finally, the ship has a piloted underwater vehicle, called the Paysis, for self-contained investigation. It has manipulators to take samples as well as photographic and geophysical instruments."

Nonetheless, the equipment by itself is not the main thing on the new ship. The principal advantage is that it is designed as a unified system based on a powerful computer center. The large computer, linked to 7 minicomputers in labs, collects and processes information from a vast complex of automatic devices and laboratory analyzers. This system is the first on our research ships.

The specific functions of a research ship make special requirements for its seaworthiness also. Here is what V. Kaz'min, captain of the flagship, said about this.

"The power plant of our ship has variable pitch propellers. This makes control much easier and permits us to carry out complex maneuvers. But what increases maneuverability even more is the special 'Aquamaster' device, a supplementary engine with a propeller. When cruising this device is housed in the stern shaft. But when it is needed, it is lowered into the water and can turn the ship in place, as much as a full 360 degrees. In addition, when paired with the main engines the Aquamaster can hold the ship in one place during even the strongest winds that blow on the high seas. And the automatic transverse propulsion unit helps the ship dock in any port without a tug and to perform certain oceanographic jobs.

"Needless to say, our ship has the latest navigation equipment based on a satellite system. It works alongside systems for determining the position of the ship based on shore radio beacons and a doppler device that measures displacement relative to the ocean floor. This set of navigation equipment makes it possible to determine the ship's position at sea continuously. Furthermore, it is highly precise, to a matter of a few dozen meters. And the automatic weather station also provides continuous information on meteorological conditions at the point where the ship is located.

The program of the new ship's first scientific cruise was worked out by a collective of scientists under the leadership of corresponding member of the USSR Academy of Sciences A. Monin, who is director of the Institute of Oceanology of the Academy. The leader of the expedition is candidate of geographic sciences V. Voytov.

"After testing the basic mechanisms and systems of the ship," he said, "and, of course, practicing procedures for working under ocean cruise conditions, the Akademik Mstislav Keldysh will head for the Western Atlantic, to the Caribbean Sea region and the so-called Bermuda Triangle. We are interested in the origins of the Gulfstream. We will carry out studies aimed at developing long-term weather forecasts and a theory of climate. Therefore, scientists from Cuba and Mexico will participate in the studies of the Yucatan Channel. In short, we have an important and interesting job in front of us."

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CSO: 1829/183

BRIEFS

STUDY OF KUROSHIO CURRENT--The research ship 'Professor Bogorov' of the USSR Academy of Sciences Far Eastern Research Center has begun research operations in the northwestern part of the Pacific Ocean. The oceanological characteristics of the Kuroshio Current will be studied in detail. At three test areas scientists will examine the dynamics of pollution of water by oil products and toxic metals and they will perfect acoustical and optical methods for probing the hydrophysical structure of the ocean. This work is part of the international program called "Vestpak" [West Pacific]. While traveling to a new test area the Soviet ship will put in at the Vietnamese port of Nha Trang. It will take on board an expedition of oceanologists of the Democratic Republic of Vietnam who will undertake joint research in line with the "South China Sea" project. [Text] [Moscow PRAVDA in Russian 16 Apr 81 p 6]

CSO: 1865/152-P

ACADEMICIAN NELEPO DISCUSSES TASKS OF MARINE HYDROPHYSICAL INSTITUTE

Kiev PRAVDA UKRAINY in Russian 1 Feb 81 p 1

[Article by Boris Nelepo, academician Ukrainian Academy of Sciences]

[Abstract] The Marine Hydrophysical Institute is continuing its productive cooperation with researchers of the USSR Academy of Sciences headed by Academician G. I. Marchuk. Together work is being done on experimental checking of mathematical models affording possibilities for timely long-range prediction of variations of climate and weather. Improvements in long-range forecasting will assist in rational formulation of a strategy for the agroindustrial complex and other branches of the national economy, preparing them in advance for climatic variations, and this means a decrease in losses to the national economy. During the 11th Five-Year Plan work will become still more active in developing effective methods for investigating and predicting physical, chemical and biological processes in the ocean and in creating new instrumentation for monitoring the state of the sea and its study on the basis of automated systems for the collection, storage and processing of data, including aerospace and other remote instrumentation. Scientists feel, with full justification, that the world ocean can and must become a sort of new "granary" for our planet, particularly as a supplier of protein. During the final year of the 10th Five-Year Plan a new division was established in the Ukrainian Academy of Sciences: the Division of Oceanology and Geography. It will bring together the efforts of a number of scientific bodies for investigating the most important problems in study of the environment. Fully comprehending the high effectiveness of programmed planning methods, during the 11th Five-Year Plan work will be emphasized under such programs as "Volna" (Wave), "Razrezy" (Profiles), "Yug" (South) and others. Work is continuing on construction of the scientific center of the Marine Hydrophysical Institute at Conakry in Guinea. The work on the Scientific Research Center on Oceanography, Heliophysics and Testing of Construction Materials is in its final stages. The projected finishing date is set for 23 February of this year.
[81-5303]

UDC 551.465

VERTICAL INTERMITTENCE OF CURRENT VELOCITY FLUCTUATIONS IN THE UPPER OCEAN LAYER

Moscow OKEANOLOGIYA in Russian Vol 21, No 2, Mar-Apr 81 pp 222-228

BELYAYEV, V. S. and GEZENTSVEY, A. N., Institute of Oceanology, manuscript received 8 Feb 80, after revision 29 Apr 80

[Abstract] The authors give an analysis of the results of measurements of microstructure of the current velocity field in the upper 270-m layer of the ocean made in one of the polygons on the 22d voyage of the scientific research vessel "Dmitriy Mendeleyev" employing a free-cable drop-sonde. The article describes the characteristics of profiles of the intensity of fluctuations of current velocity with vertical scales of less than 3.3 m. The empirical distribution of thicknesses of layers with well-developed microstructure of the current velocity field is approximated by the superpositioning of two exponential distribution laws. Also examined is the two-dimensional probability density function for the thicknesses of the mentioned layers and the mean level of fluctuations of current velocity in them. The distribution of the gradient Richardson number with depth is given. Considerations are expressed concerning the possibility of the origin of the considered layers as a result of shear instability and the fine structure of the current velocity field. Figures 5; references 11: 8 Russian, 3 Western.
[153-5303]

UDC 551.463(261)

SUMMARY OF EXPEDITIONARY INVESTIGATIONS OF ATLANTIC OCEAN WATERS

Moscow OKEANOLOGIYA in Russian Vol 21, No 2, Mar-Apr 81 pp 389-393

SOROKINA, N. A., Marine Hydrophysical Institute Academy of Sciences Ukrainian SSR, manuscript received 12 Feb 80

[Abstract] Numerous regional investigations of water transparency in the Atlantic Ocean made by the Optics Section of the Marine Hydrophysical Institute are of great importance in studying the optical structure of waters, its variability in time and space. The author here summarizes the results of these investigations in order to ascertain the degree of study of the structure of the field of the index of attenuation of waters in the Atlantic Ocean and generalize the results of observations. It is noted that there are still cases when individual expeditions proceed to work in the ocean without allowance for data obtained earlier. A review of the data on

water transparency obtained earlier can assist in the intelligent planning of new expeditions. The article therefore gives information on instrumental measurements of transparency obtained on expeditionary voyages of scientific research ships of the institute in the Atlantic Ocean during the period 1961-1979. Investigations have been made by direct measurements in situ using submergible instruments. On most voyages measurements have been made by continuous sounding in 1-6 parts of the visible spectrum. All these measurements are plotted on a map accompanying the text. A table gives the numbers of the voyages, the number of the stations, the work regions, the names of the ships making measurements of the vertical distribution of transparency. The table gives the number of parts of the spectrum for which transparency measurements were made, depths and seasons when the observations were made and continuity or discreteness of observations. Figures 1, tables 1; references: 6 Russian.
[153-5303]

UDC 551.466.1

MEASUREMENT OF SEA WAVES BY THE RADAR AMPLITUDE METHOD

Moscow OKEANOLOGIYA in Russian Vol 21, No 2, Mar-Apr 81 pp 197-202

ROZENBERG, A. D., Institute of Oceanology, manuscript received 13 Mar 80, after revision 19 May 80

[Abstract] The results of radar measurement of wind waves from a fixed pile base are given. These data demonstrate the possibilities of the radar amplitude method for measuring sea waves. The experimental method is fully described. The apparatus used was a standard "Don" shipboard radar station with a wavelength of 3 cm which was mounted on a mast at a height of 30 m above sea level (transmitter pulse power 75 KW, width of directional diagram in the azimuthal plane 1°, horizontal polarization, pulse duration 0.1 μsec, pulse repetition rate 1600 Hz). It is shown that the two-dimensional pattern of amplitude of signals scattered at glancing angles from the wave-covered sea surface quite adequately reflects the spatial-temporal structure of wind waves. The shortcomings of the amplitude method impeding a precise restoration of the profile of the irradiated surface and limiting its use in ascertaining the absolute heights of waves can be neglected in an investigation of the spatial-temporal structure of waves due to the relative nature of the measurements. Using the two-dimensional spectrum of radar videosignals it is possible to obtain data on the periods, velocities of movement and direction of arrival of the main waves, as well as information on the dimensions and velocity of movement of groups of waves. Further development of the method may well make possible absolute measurements of the wave parameters. Figures 5; references 2: 1 Russian, 1 Western.
[153-5303]

UDC 551.465.55

MERIDIONAL ASYMMETRY OF SYNOPTIC VARIABILITY OF MACROSCALE OCEANIC CIRCULATION

Moscow IZVESTIYA AKADEMII NAUK SSSR: FIZIKA ATMOSFERY I OKEANA in Russian
Vol 17, No 3, Mar 81 pp 329-331

SEIDOV, D. G., Institute of Oceanology, manuscript received 27 Feb 80

[Abstract] In an earlier study (IZV. AN SSSR: FAO, Vol 16, No 1, pp 73-87, 1980) the author discussed some results of computations of an eddy-forming model of a macroscale circulation. Later a number of numerical experiments were carried out for studying the role of different physical factors in the synoptic dynamics of ocean currents. In addition to other qualitative peculiarities of synoptic variability there was found to be a meridional asymmetry in the eddy regime of circulation. As an example the author presents four maps obtained in one of the numerical experiments which he carried out. A circulation was excited and maintained in an idealized oceanic basin of rectangular configuration with a plane bottom, extended along the meridian, with dimensions in latitude and along the meridian of 715 and 1,105 km respectively and with a depth of 2 km with fluxes of heat and momentum through the ocean surface. The heat flow was proportional to the difference between the computed temperature of the water surface and the stipulated atmospheric temperature T_A at the ocean surface. With the presence of a gradient in atmospheric temperature there is an asymmetry in the northern and southern branches of the circulation. The author emphasizes the qualitative difference in the eddy-formation process in these branches. On the basis of this numerical modeling of synoptic variability it was possible to define a fundamental characteristic of eddy formation against the background of general circulation of the ocean: a predominant concentration of the energy of eddies in zones of anticyclones (in the middle latitudes). Figures 4; references: 2 Russian.
[137-5303]

FORMATION OF A DIRECTED TSUNAMI WAVE AT THE EXCITATION FOCUS

Moscow IZVESTIYA AKADEMII NAUK SSSR: FIZIKA ATMOSFERY I OKEANA in Russian
Vol 17, No 3, Mar 81 pp 296-304

VOIT, S. S., LEBEDEV, A. N. and SEBEKIN, B. I., Institute of Oceanology, manuscript received 12 Mar 80

[Abstract] A new mechanism of formation of directed radiation of unsteady waves caused by the local properties of the excitation focus is described. The authors feel that the direction of radiation cannot be explained within the framework of a traditional model: with small vertical displacements of the bottom the transfer of momentum to the water masses occurs only in a vertical direction. Real earthquakes are accompanied by slides, the formation of fissures and horizontal displacements. The mathematical modeling of horizontal effects leads to considerable analytical difficulties. A natural approach would be the introduction of viscous stresses in the bottom boundary layer. This approach, however, considerably complicates the mathematical formulation of the problem, not making possible a

graphic interpretation of the results. Moreover, it is entirely obvious that in processes of such a scale molecular viscosity is unimportant and the numerical value of the coefficient of horizontal exchange of momentum in the bottom layer is inadequately well known. Accordingly, in this study the process of transfer of horizontal momentum to water masses is modeled by the application of effective mass forces to fluid particles in the epicentral zone of tsunami generation. It is shown that if an underwater earthquake imparts a horizontal momentum to the water masses this results in the excitation of an asymmetric wave. It is further shown that an anisotropy of radiation persists at arbitrarily great distances from the epicenter. References: 3 Russian.
[137-5303]

UDC 551.466.43

SPREADING OF A MIXED SPOT IN A ROTATING STABLY STRATIFIED FLUID

Moscow IZVESTIYA AKADEMII NAUK SSSR: FIZIKA ATMOSFERY I OKEANA in Russian
Vol 17, No 3, Mar 81 pp 286-295

ZHURBAS, V. M. and KUZ'MINA, N. P., Institute of Oceanology, manuscript received 26 Dec 79

[Abstract] It was concluded by H. Stommel, et al. (TELLUS, Vol 19, No 2, pp 306-325, 1967) that the earth's rotation can play a significant role in the dynamics of density inhomogeneities in the ocean. It was shown that Ekman boundary layers can exist at the discontinuity of a homogeneous lamina and the surrounding stratified medium. The authors have analyzed the characteristics of evolution of a mixed spot in a stably stratified medium associated with its rotation. It is demonstrated that rotation of a fluid exerts no significant influence on a spot of small volume $V \ll V_0 = (N/f)^2 L_e^3$ (N is the Väisälä-Brent frequency, f is the Coriolis parameter, $L_e = (\nu/f)^{1/2}$ is the Ekman scale, ν is the effective viscosity of the medium). If $V \gg V_0$ a spreading phase exists in which the spot constitutes an anticyclonic eddy (f is positive), slowly evolving as a result of viscous transfer of momentum into the ambient fluid. Asymptotic dependences of the characteristic dimension of the spot on time corresponding to this phase are found. The results of the analysis are used in describing fine-structured inhomogeneities of the density field in the ocean. Figures 3; references 15: 10 Russian, 5 Western.
[137-5303]

UDC 551.465.55

USE OF THE CORRELATION COEFFICIENT IN EVALUATING THE VARIABILITY OF VERTICAL MACROSCALE WATER CIRCULATION

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 256, No 6, 1981 pp 1488-1490

AGAPITOV, Ye. N. and GRITSENKO, A. M., Institute of Oceanology, manuscript received 24 Jul 80

[Abstract] The development of concepts concerning macroscale circulation of waters in the real ocean is based on an analysis of the results of computations using numerical models. The variability of circulation with depth is usually evaluated qualitatively, on the basis of a visual comparison of maps of currents at different levels. In this article, using linear correlation coefficients, a quantitative evaluation is made of the nature of vertical circulation. The field of currents in the Pacific Ocean was selected as the investigated area. In order to trace how the field of currents changes with depth, circulation at each standard horizon was correlated with circulation at the surface. The current vectors were expanded into components (u and ν) and the elements of the main diagonal of the correlation matrix were computed: r(u) for the zonal and r(ν) for the meridional components of the velocity vector. For the ocean as a whole $r(u) > r(\nu) > 0$ in its entire depth, that is, zonal transport in the water layer to a great degree retains the characteristics of surface transport, moreso than for the meridional component. In the surface layer r(u) and r(ν) rapidly decrease and attain local minima at different depths: 50 m (0.76) and 100 m (0.58) respectively. Then there is a small increase in the correlation coefficients to a depth of 150 m. These peculiarities in the shape of the curves reflect the influence of the drift component, expressed in the rotation and simultaneous weakening of the drift current with depth. In addition, the relative contribution of the wind component to the zonal component of the resulting current is less than in the meridional direction, which causes a great change in the latter in the Ekman layer. In the boundary layer between the surface and intermediate waters r(u) changes from 0.76 at 200 m to 0.61 at 500 m, whereas r(ν) virtually does not decrease: 0.57 at the upper and 0.55 at the lower boundaries of the layer. This difference in the nature of the curves can be caused by the displacement of macrocirculation systems with depth in a meridional direction. An analysis of the circulation maps shows that such a displacement exists and occurs in the direction of an increase in geographical latitude. In intermediate waters (500-2,000 m) the range of change in the correlation coefficients is minimum, evidence of relative stability of the circulation field. This stability is associated with the disappearance of the explicit influence of processes caused by the active exchange of matter and energy between the surface of the ocean and the atmosphere, on the one hand, and the inadequately expressed influence of bottom relief, on the other. A small decrease in r(u) (0.61-0.51) and r(ν) (0.55-0.43) is evidently caused by local changes in the field of currents. It was found that stationary macroscale circulation of waters retains its principal characteristics from the surface to depths of 2,000-3,000 m. Intermediate waters have the greatest stability. The hypothesis of the presence of a circulation in depth opposite the surface circulation was not confirmed at the scale of the entire ocean. Figures 1; references: 7 Russian.
[150-5303]

UDC 551.465.7:519.

TURBULENT HEAT FLOWS AT THE CASPIAN SEA SURFACE DURING PREVAILING WINDS WITH ALLOWANCE FOR ATMOSPHERIC STRATIFICATION

Baku IZVESTIYA AKADEMII NAUK AZERBAYDZHANSKOY SSR, SERIYA NAUK O ZEMLE: GEOGRAFIY
in Russian No 4, 1981 pp 78-82

ABAKAROV, M. I. and UTURGAURI, L. G.

[Abstract] A determination of heat flows is necessary in solving many problems in oceanology and marine meteorology. The magnitudes of the heat flows in the surface (near-water) air layer can be determined directly from measurements of fluctuations or computed from gradient observations by determining the profiles of wind velocity V(z), temperature t(z) and humidity e(z) over the sea surface. The authors for the first time have computed the vertical turbulent heat flows (H) over the Caspian Sea with allowance for humidity and temperature stratification. Allowance for these factors was reflected in the results of computations, as indicated by a comparison of values computed with a constant exchange coefficient C'_θ and variable C_θ, determined for each specific case (depending on synoptic conditions) for the middle months of the seasons. The difference between the computed H and H' values can determine the values of the corrections to the heat balance components. The values of the turbulent heat flows H were determined from the standard (mean) fields of hydrometeorological elements (Δ t, V) with the directions of winds prevailing over the Caspian Sea (N, NW and S, SE) during February, April, July and November. An analysis and comparison indicated that the H values, computed for N, NW and S, SE winds differ considerably both from one another and from the values computed for mean conditions. In some cases the difference is expressed as far as a change in the sign determining the direction of the flow (H) in the atmosphere-sea system. The results are important in the field of oceanology, especially for refining the heat balance components, the preparation of hydrometeorological forecasts and solution of other scientific and practical problems. They are also important in the interpretation of aerospace data since the temperature difference between the thin surface film and the lower-lying water layers is determined by turbulent heat exchange. Tables 1; references: 6 Russian.
[143-5303]

UDC 534.232

INVESTIGATION OF THE EFFECT OF DAMPING ON THE CHARACTERISTICS OF ROUND ACOUSTIC WAVEGUIDES

Vilnius UL'TRAZVUK in Russian No 12, Dec 80 pp 65-69

SHESHTOKAS, K. and DOMARKAS, V., Kaunas Polytechnic Institute and Special Ultrasound Laboratory, manuscript received 21 May 79

[Abstract] Many studies have appeared devoted to study of the propagation of elastic waves in acoustic waveguides with free boundaries. But known investigations of the dispersion characteristics of undamped waveguides for the most part cover only

the region of the first and second modes. Accordingly, the authors attempted to ascertain the extent to which damping of lateral surfaces of the waveguide affects their dispersion and amplitude characteristics. The study of the characteristics of acoustic waveguides was carried out in the frequency range from 0.2 to 10 MHz. Measurements of the dispersion and amplitude characteristics were made for steel, brass and titanium waveguides of different diameters and lengths. In determining the effect of damping on the dispersion and amplitude characteristics of waveguides some of the waveguides were covered by epoxy resin. The damping base varied from 10 to 200 mm. Measurements were made by the pulsed method. Due to the high absorption of ultrasound with the damping of the waveguides the amplitude of the exciting radiopulses had to be about 50-150 V. It was necessary to develop a special unit for shaping such radiopulses. It was found that with the damping of metal waveguides by epoxy resin there was no appreciable change in the dispersion characteristics. (Figures 1-6 in the text show that the dispersion characteristics of damped waveguides are essentially the same as the dispersion characteristics for undamped waveguides.) However, the damping of the lateral surfaces of waveguides exerts a significant influence on their amplitude-frequency characteristics. The transfer coefficients for the higher modes are several times less than the transfer coefficient for the fundamental mode of the oscillation, but in the case of damped waveguides the lower modes attenuate more rapidly than the higher modes. This is attributable to the fact that at high frequencies plane waves predominate in the waveguide and therefore the damping of the lateral surfaces of the waveguide exerts less influence on wave absorption. Figures 6; references 5: 1 Russian, 4 Western.
[110-5303]

UDC 534.6-8

USE OF DIGITAL FUNCTIONAL CONVERTERS IN ULTRASONIC MEASURING SYSTEMS

Vilnius UL'TRAZVUK in Russian No 12, Dec 80 pp 31-36

KAZHIS, R.-I. and ANTANAYTIS, S., Kaunas Polytechnic Institute and Special Ultrasound Laboratory, manuscript received 13 May 79

[Abstract] Continuing efforts are being made to bring about the full automation of the processes of measurement and processing of ultrasound measurement data. In such procedures it is best to use functional converters of the time-digit type, simple in structure and ensuring a good connection between the analog elements of the primary processing unit and the digital units for the display and storage of data. The article gives block diagrams of different variants of units for such conversion; these are described in detail, in each case with clarification of their advantages and disadvantages, preferred use and operating principles. However, all are relatively simple in design and in many cases their use is preferable to more complex microprocessors. One shortcoming is a relatively long conversion time, especially in computing higher-degree polynomials. However, when performing some of the most important operations described by the algorithms also provided in this article the time required is several tens of microseconds. Figures 4; references: 4 Russian.
[110-5303]

UDC 551.46.08:681.3

OM 75 OCEANIC MEASUREMENT COMPLEX. UNIVERSAL APPARATUS FOR DATA COLLECTION ON SCIENTIFIC RESEARCH SHIPS

Obninsk GIDROMETEOROLOGIYA: SERIYA: AVTOMATIZATSIYA SBORA I OBRABOTKI GIDROMETEOROLOGICHESKOY INFORMATSII: EKSPRESS-INFORMATSIYA in Russian No 1(74), Jan 81, pp 1-6

MÖCKEL, F., manuscript received 24 Oct 80

[Abstract] The scientific research ships of the Institute of Oceanography of the Academy of Sciences GDR have for many years used electronic telemetric instruments for the collection of oceanographic data. The apparatus used since 1976 has an elaborate sense of sensors and is known as the OM 75. It is suitable for oceanic work at a depth of more than 1,000 m and can be used for installation on small ships. The ship and submergible unit are connected by an SK/63 cable; the resolution of each sensor is 24 000 units (> 14 bits); all variables are measured simultaneously; the apparatus works on ships with a displacement up to 300 tons; the depth of submergence is a minimum of 2000 m; the probe takes water for analysis (chemical, biological, traces of metals); the measuring complex is the central point for the collection and processing of data reaching the ship (hydrological, meteorological, navigational, geological) and has frequency-analog and digital data input. Five freely combinable frequencies are used in transmitting commands to the submergible unit. The submergible unit is protected against ambient pressure up to 30 MPa by a cylindrical housing of high-quality steel. In the upper part of the cylinder there is a group of 12 containers each with a volume of 2.7 dm^3. The cable carries a d-c current of 0.65 A.. The article describes a "minimum" variant of the OM 75 which is suitable for smaller ships (with a working depth to 600 m). Each ship carrying the complex must have two electronics specialists in the crew.
[111-5303]

UDC 551.46.08:681.3

EXPERIENCE IN USE OF THE OM 75 MEASUREMENT COMPLEX

Obninsk GIDROMETEOROLOGIYA: SERIYA AVTOMATIZATSIYA SBORA I OBRABOTKI GIDROMETEOROLOGICHESKOY INFORMATSII: EKSPRESS-INFORMATSIYA in Russian No 1(74), Jan 81 pp 6-8

FRANCKE, E., manuscript received 24 Oct 80

[Abstract] The general details concerning the OM 75 measurement complex are given in another article in this same issue of the publication (pp 1-6). The most important advantages of the complex are: high measurement accuracy; direct monitoring of measured values (automatic and manual) during station operation; incorporation of new investigation methods due to a shorter time for reaction of the sensors; a considerable increase in the content of information on vertical profiles and time series; considerable saving of time in collecting and processing measured values; a substantial easing of work on deck. Due to use of this system it has been possible to solve many problems relating to qualitative changes in the makeup of expeditions,

tion work methods and formulation of new concepts for measurement programs. However, when using the OM 75 certain problems arise. The sensors used at the present time do not in all cases meet the requirements of oceanologists. This relates to both their long-term stability and accuracy of calibration in different cases. It is particularly difficult to measure pressure for subsequent determination of depths in a sea highly stratified in temperature, as in the Baltic Sea. The accuracy of the pressure sensors does not meet requirements. Such measurement complexes as the OM 75 make it possible to obtain continuous series of data on vertical, horizontal and time profiles. The collection of data is synchronized, with a time interval of 1.2 sec. These and other properties of the measurement complex make it possible to carry out detailed investigations of microstructure of the sea. The available results and experience with use of the different variants of the OM 75 indicate that the measurement method, involving use of the electronic computer, requires improvement and the solution of a large number of problems.
[111-5303]

UDC 551.463

VALUES OF LOCAL RICHARDSON NUMBERS IN THE OCEAN

Moscow OKEANOLOGIYA in Russian Vol 21, No 2, Mar-Apr 81 pp 211-216

VARLATYY, Ye. P., OZMIDOV, R. V. and PYZHEVICH, M. L., Institute of Oceanology, manuscript received 23 Apr 80, after revision 25 Jun 80

[Abstract] Synchronous measurements of the fine vertical structure of the density and current velocity fields were used in computing the values of the local Richardson numbers. The data were collected on the 22d voyage of the "Dmitriy Mendeleyev." The accuracy in measuring current velocity and direction with the ISTOK probe was 3 cm·sec^{-1} and 3° respectively. The measurements were made in a vertical sounding regime from a drifting ship. The rate of sounding was 0.5-0.8 m·sec^{-1}. Computations of the components of flow velocity, their gradients, water density, density gradients, Richardson numbers and also the first four moments and empirical distributions of these parameters were made using a shipboard computer. The determined depth distributions of Richardson numbers indicated that in some cases in individual thin layers conditions are created for the appearance of shear instability and the generation of turbulence. It is demonstrated that the empirical distributions of the Richardson number values can be approximated by exponential curves. In contrast to the strong variability of vertical profiles of the Ri numbers their empirical distributions are more stable and therefore they evidently can serve as a quite representative characteristic of the fine structure of hydrophysical fields. Figures 4, tables 1; references 9: 4 Russian, 5 Western.
[153-5303]

UDC 62-50:551.3

METHOD FOR PROCESSING MARINE GEOLOGICAL INFORMATION ON COMPUTER

Moscow SOVREMENNYYE PROBLEMY GEOLOGII MOREY I OKEANOV in Russian 1980 (signed to press 3 Oct 80) pp 188-193

SHCHERBAKOV, V. S. and GRACHEV, A. A.

[Abstract] Specialists at the All-Union Scientific Research Institute of Marine Geology have developed a system for the registry and coding of data and reference information, checking and preparing data for inclusion in a data bank, forming of a data bank and in this way solving problems in the automated processing of geological data. This has resulted in the routine operation of an automated system for the collection, storage and processing of marine geological data. The functioning of the system begins with the registry of data in forms specially intended for subsequent automated processing. In creating standardized registration cards an allowance was made for the inevitable broadening of the complex of marine geological work and the need for incorporating archival geological data in the bank. The systematic arrangement of data is attained by a territorial and organizational grouping of the collected data. The territorial grouping unit was a 10° square and the organizational unit was a marine geological expedition. Data registry is accompanied by coding of the descriptive part of the geological information. The functions of storage and automated processing of data are performed by a data search system. For incorporating the marine geological data in the bank they are transferred from the registration cards to punch cards. The structure of the data recovery system is organized and optimized taking into account the makeup and volume of the data, types of inquiries and feed-out of the results and the possibilities of supplementing the data bank with newly received data. These data are classified as "reference" (general information on the expedition, work done, samples taken, etc.) and "factual" (characteristics of composition and properties of investigated samples). All the reference data can be introduced into the data recovery system directly after completion of the work at sea, whereas the actual data are introduced in the course of office processing of expeditionary materials. The structure of the data recovery system ensures a rapid search for any desired information. Provision is made for routine supplementing of the data bank with newly received data and the use of reference data in the search for actual data. The data recovery system is supported by a complex of programs. A block diagram of the system is given and serves as a basis for a textual description.
[105-5303]

TERRESTRIAL GEOPHYSICS

SUPERDEEP DRILLING PROGRAM IN USSR DESCRIBED

Moscow TRUD in Russian 5 Apr 81 p 1

[Article by R. Sumbatov, deputy minister, USSR Geology Ministry: "The Earth Reveals Its Secrets"]

[Text] Forty-nine Heroes of Socialist Labor are working in the USSR Geology Ministry system. More than 160 deposits of petroleum and gas have appeared on the geological map of our country during the years of the Tenth Five-Year Plan. About 3,000 drilling teams and mining crews have carried out their tasks ahead of time during the elapsed five-year plan. Very large deposits of copper, coal, lead and zinc have been discovered in the zone of the Baykal-Amur Railroad.

It is stated in the "Principal Directions of Economic and Social Development of the USSR in 1981-1985 and in the Period to 1990": "Ensure the accelerated development of work on geological study of the territory of the country, an increase in the explored mineral raw material resources, especially fuel-energy resources." In the Soviet Union for the first time in world practice there has been formulation of a unique program for the multisided study of structure of the earth's crust by means of drilling of a series of superdeep boreholes. Boreholes will be drilled at different points in our country which will provide scientists with highly valuable material on the processes transpiring in the deep layers of the planet, on the structure and properties of matter at a depth greater than 10 kilometers.

The first goal has already been reached. In the Kola superdeep borehole for the first time in history a depth of more than 10,780 m was reached. It is frequently asked: "Why is this necessary? Is it worth the cost and energy to achieve such expensive records?"

However paradoxical it may be, although we extract from the earth billions of tons of minerals, in essence we know very little about the structure, composition and internal life of our planet. Mineral resources are not infinite. They can be exhausted. The search for new deposits is necessary for the vigorous development of the national economy. The 26th Congress CPSU issued the following challenge to geologists: "Intensify the search for and exploration of deposits of rich and easily enriched ores of ferrous and nonferrous metals, bauxites, phosphorites, coal, fuel shales..."

The depth of shafts and producing holes does not exceed 1 1/2-5 kilometers. That is, we have mastered only the uppermost "crust" of the planet. If we are successful in advancing even one kilometer deeper, we will have access to new mineral deposits. However, before beginning the commercial exploitation of the deeper layers it is necessary to know what they are like, whether it makes sense to begin their exploitation.

The Kola superdeep borehole is the first descent into the depths of "geospace" and should answer many of the questions exciting us. What practical results have already been obtained from this experiment? First, specialists now have some idea about a more than 10-km section of the earth's crust in its natural state. This section is a standard not only for the Karelian-Kola region, where there is exploitation of major deposits of phosphate raw material and nickel, but also for other ancient complexes in the country and world where there are highly important deposits of apatites, ferrous, nonferrous and precious metals.

Unique material has been obtained on ore-formation processes in the lower layers of the earth's crust. In the interval 1,665-1,830 m there were found to be commercially valuable copper-nickel ores present in an earlier unknown stratum. At depths of 6,500-9,500 m there were zones of copper, lead and zinc mineralization which it was assumed earlier can exist only in the upper layers of the earth's crust. It was demonstrated that not only the upper, but also the deep horizons of the earth's crust are favorable for the formation of minerals. This conclusion is of fundamental importance for the further development of mineral science and the search for new ore deposits.

The borehole furnished specialists with many surprises. According to predictions, each 100 meters the temperature should rise by 1°. This assumption was justified only to a depth of three kilometers. Then each 100 m the temperature began to increase by 2 1/2°. At a depth of 10 km the instruments already read 180°. It was found that this phenomenon was associated with a powerful heat flow rising from the earth's deep layers. It was curious that the mud pumped into the borehole was returned to the surface heated to 45°. Scientists feel that sometime in the future water will be pumped into such boreholes, will be heated there and then will be used for the heating of cities and villages, greenhouses and hothouses.

Highly mineralized water solutions were found at a depth of six kilometers. This was a real scientific sensation. What was the origin of brines at such a depth? After all, until then it had been assumed that not even droplets of moisture could be present in Precambrian granites because they were impermeable for it. I have told only about some of the results obtained in the course of the experiment.

Now a few words about the technical aspect of drilling. The drilling of boreholes to a depth of more than nine kilometers is an exceedingly difficult undertaking.

For example, in the Kola superdeep borehole each three or four hours it is necessary to change the bit. During this time 6-12 meters are penetrated. More time is spent on raising the pipes for replacing the bit than on drilling itself. The tool must be replaced so quickly because it is necessary to drill in the granite layer. As we see, nature does not willingly part with its secrets. In the entire world there is only one borehole with a depth greater than 10 km. This is our Kola superdeep hole. Two other boreholes with a depth greater than 9 km are located in the United States.

The attack on the earth's deep layers is being carried out using the most improved Soviet equipment. For example, the drill rig is an entire plant with a central 25-story building. Even experienced drillers are surprised by the magnitude of the machines. Just one column of pipes with turbodrill gear weighs 180 tons! And all this equipment normally operates under severe polar conditions and has been doing so now for more than 10 years. The many years of equipment operation made it possible to find new original design solutions for drilling work. Considering the results of the experiment specialists are working on the creation of more perfect apparatus.

After completion of drilling of the Kola borehole it will be transformed into a singular natural laboratory where studies will be made of the processes transpiring at great depths.

The results of the first superdeep drilling have shown that such boreholes are vitally necessary for solution of both practical and scientific problems. In our country a new long-range program has been formulated for superdeep drilling.

The Ural and Tyumen' superdeep boreholes will be started in the immediate future. One of the purposes of the Tyumen' borehole will be the search for and study of new petroleum- and gas-bearing horizons. Still another borehole will be drilled in the neighborhood of Noril'sk.

The program is to run for many years. On the basis of the collected data scientists will prepare detailed maps of the distribution of ore and energy raw materials in the deep layers of the planet. There is every basis for assuming that the implementation of the program for the thorough study of the deep layers in the Soviet Union will lead to a radical improvement of our knowledge concerning the characteristics of structure of the earth's crust, the mechanisms of its formation and development. We are obtaining a key to new mineral-raw material resources which will make possible more complete satisfaction of the needs of the national economy. The attack on the deep layers of our planet is continuing on an increasingly broader front.

5303
CSO: 1865/151

BRIEFS

IMPROVED INCLINOMETER FOR BOREHOLE--An improved inclinometer--an instrument for determining the azimuth and angle of deviation of superdeep boreholes--has been developed and manufactured at the 'Geofizpribor' plant in Kiev. This highly effective device works trouble-free at temperatures as high as 200 degrees and under a pressure of 1800 atmospheres. The drilling of the superdeep borehole on the Kola Peninsula takes place precisely under such conditions. The device manufactured by the Kiev specialists was tested there at a depth of 10 kilometers. The enterprise has received an order to manufacture similar apparatus for the investigations of deep and high-temperature boreholes in other regions of the country. [Excerpt] [Kiev RABOCHAYA GAZETA in Russian 12 Apr 81 p 2]

CSO: 1865/147-P

UDC 551.1/550.837

DEEP CONDUCTIVITY OF SAKHALIN

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 256, No 6, 1981 pp 1452-1455

KOSYGIN, Yu. A., academician, NIKIFOROV, V. M., AL'PEROVICH, I. M., KONONOV, V. E. and KHARAKHINOV, V. V., Institute of Tectonics and Geophysics of the Far Eastern Scientific Center USSR Academy of Sciences, Oka Geological Prospecting Expedition of the All-Union Industrial Combine "Sakhalinmorneftegazprom, and the Sakhalin Division of the Sakhalin State Scientific Research and Planning Institute of the Petroleum and Gas Industry, manuscript received 9 Apr 80

[Abstract] Many magnetotelluric soundings have now been made on Sakhalin. The machine methods which have now been developed for data processing of records in the range of long periods (T = 100-20 000 sec) are reliably determining the depth of the basement and conducting layers in the crust and upper mantle. A figure shows magnetotelluric sounding curves obtained along the strike of the principal structural elements of the island. A family of experimental curves is given in comparison with two theoretical curves for a model of structure of the upper mantle not containing conducting layers. The right descending branches of the experimental curves are situated considerably to the left of the descending branches of the theoretical curves. This is evidence of the presence of conducting layers in the crust and upper mantle. The generalized geoelectric section of Sakhalin was found to contain four main conducting layers. The first corresponds to the sedimentary cover, the second is situated in the crust at depths of 10-15 km, the third and fourth are in the upper mantle at depths of 70-120 and about 200 km respectively. These materials make it possible to judge the complex relief of the surface of the asthenospheric layer. Comparison of these data with the results of other geological-geophysical investigations made it possible to define three types of lithosphere on Sakhalin. The first type is characterized by a considerable development of a thick (35-37 km) continental crust. The "granite" and "basalt" layers have equal volumes. The sedimentary layer is either absent or has a limited extent. The second type is characterized by a crustal thickness of 32-33 km, a decrease in the thickness of the "granite" layer (8-12 km) and an increase in the thickness (3-7 km) of the sedimentary deposits. The third type is characterized by a minimum thickness (about 30 km), an almost complete absence of the "granite" layer and a thick (8-12 km) sedimentary cover. It was found that the depth of the asthenosphere is essentially tied in to the structure of the earth's crust and the layers making it up. Figures 3; references: 3 Russian.
[150-5303]

UDC 550.831:551(.

GRAVITATIONAL FIELD OF SOUTHWEST ASIA AND ITS CORRELATION WITH GEOSTRUCTURE

Moscow VESTNIK MOSKOVSKOGO UNIVERSITETA, SERIYA 4: GEOLOGIYA in Russian No 2, Mar-Apr 81 pp 85-90

SEMENDUYEV, M. M., Moscow State University, manuscript received 6 Apr 78

[Abstract] The author has compiled a composite gravimetric map of southwest Asia in the Bouguer reduction. The regional characteristics of the gravity field are characterized, the investigated area is regionalized and considerations are expressed concerning the geological nature of the regional gravity anomalies. In the described region the gravity anomalies vary in a wide range: from +160 mgal in the Levant basin and +200 mgal on Cyprus to -200 mgal in Iran. Positive Bouguer anomalies are associated primarily with the areas of the Mediterranean and Black Seas; negative anomalies are found for the most part on the land. The most intensive negative Bouguer anomalies (less than -100 mgal) are found in the central part of Turkey and take in almost all the territory of Iran and part of Afghanistan. The Near East is characterized by intermediate Bouguer anomalies (from +40 mgal to -80 mgal). The materials presented here show that in the considered region there is a close correlation between Bouguer anomalies and the thickness and structure of the earth's crust, the characteristics of geological structure, and also the isostatic state and dynamics of individual geoblocks. Figures 1; references 14: 12 Russian, 2 Western.
[155-5303]

UDC 528.711.1(202):55

USE OF SPACE SURVEY MATERIALS IN GEOLOGICAL INVESTIGATIONS

Moscow GEODEZIYA I KARTOGRAFIYA in Russian, No 4, Apr 81 pp 48-52

MEZHELOVSKIY, N. V. and BRYUKHANOV, V. N.

[Abstract] Space geological methods have come into particularly broad use during the Tenth Five-Year Plan. The following are the principal directions in the use of space information in geology: creation of specialized space geological production (space geological, space tectonic, space mineragenic and other maps); supplementation of geological maps compiled by traditional methods with structural elements interpreted on the basis of materials from space surveys; prediction and exploration work for different types of minerals; solution of geological problems related to the history of development and structure of the earth and other planets of the solar system. During the years 1976-1980 space geological mapping was carried out over an area of more than 6 million square kilometers in territories adjacent to the Baykal-Amur route, the Okhotsk-Chukotka zone, the East Siberian platform, the Soviet part of the Baltic shield, Western Siberia, and elsewhere. The small-scale study of petroleum and gas basins is being carried out for the most part by space tectonic mapping. These materials are being used in compiling

petroleum and gas regionalization maps, in defining areas most promising in the search for petroleum and gas. In 1980 the Space Geological Map of Linear and Annular Structures of the Territory of the USSR at a scale of 1:5,000,000 was compiled and published. It shows the results of interpretation of space photographs from artificial earth satellites of the "Meteor" type with a resolution at the ground level of about 1 km. This map is used in establishing the patterns of distribution of large space geological structures in the territory of the country. The determination of the correlation between mineral deposits and space geostructural features made it possible to proceed at the end of the Tenth Five-Year Plan to the preparation of specialized space mineragenic maps, as is especially important for regions relatively poorly studied in geological respects. In addition to the creation of specialized geological maps, the information received from space is being used extensively in the compilation of ordinary geological maps, including in the additional study of earlier surveyed areas. To an increasing degree as a result of space geological mapping and mineragenic analysis it has been possible to define sectors which with respect to different criteria are promising with respect to the detection of minerals. Geologists in their practical work are using photographs from global to local levels of generalization. Space methods are inseparably related to aerial methods, mutually supplementing one another. It can be said now with assurance that not one type of regional geological investigations is being carried out without the use of materials from remote surveys. In the Tenth Five-Year Plan the "Format" automated system for the processing of aerospace information, based on an electronic computer of the YeS series, was developed and put into operation. But space geology is a young direction in geological research and is still undergoing rapid development; its possibilities have scarcely been tapped. With each passing year there is a broadening of the range of geological problems which can be solved using the materials received from space. These materials and the results of space visual observations are being used in seismic regionalization, in the study of regions of recent volcanism, in investigating large systems of displacements and movements of individual blocks in the earth's crust, in hydrogeological, geological engineering and geomorphological investigations, etc.
[165-5303]

UDC 550.348

ELECTRIC AND ELECTROCHEMICAL EARTHQUAKE PRECURSORS

Moscow IZVESTIYA AKADEMII NAUK SSSR: FIZIKA ZEMLI in Russian No 3, Mar 81 pp 55-59

CHELIDZE, T. L., Geophysical Institute Georgian Academy of Sciences, manuscript received 28 Aug 79

[Abstract] An attempt was made to clarify the nature of a new class of mechanoelectric effects described in a series of papers by Y. Yamazaki (BULL. EARTHQ. RES. INST. UNIV. TOKYO, 43, No 4, 783, 1965; 44, No 4, 1553, 1966; 47, No 1, 99, 1969). Since the explanation given by Yamazaki seems doubtful, the author fully reviews and analyzes the data and proposes two realistic variants explaining the observed phenomena: a) the percolation phenomenon in partially moistened rock; b) the electrochemical transformation of small deformations into a potential difference.

The most natural explanation seems to be a high mechanoelectric sensitivity, that is, electrochemical phenomena arising during the deformation of highly porous media saturated with an electrolyte. The effects observed by Yamazaki may not be caused at all by a change in resistivity, but by a variation of emf of an electrochemical nature in a porous moistened medium in connection with a change in the stressed state. The problem cannot be regarded as finally solved and it is recommended that laboratory modeling be employed for this purpose. References 20: 11 Russian, 9 Western.
[135-5303]

UDC 550.831

CONSTRUCTION OF EQUIVALENT SOLUTIONS IN THE TWO-DIMENSIONAL INVERSE GRAVIMETRIC PROBLEM

Moscow IZVESTIYA AKADEMII NAUK SSSR: FIZIKA ZEMLI in Russian No 3, Mar 81 pp 60-67

VORONIN, V. V. and CHEREDNICHENKO, V. G., Computation Center, Siberian Department USSR Academy of Sciences, and Novosibirsk Institute of Soviet Cooperative Trade, manuscript received 8 Aug 79

[Abstract] In the interpretation of geophysical potential fields the density of the disturbing body frequently cannot be considered stipulated. The problem of finding both the region and density from the measured potential has a set of solutions. For example, circles of different radius with a center at the same point with constant densities specially selected along these radii create an identical external potential. A set of pairs consisting of regions and densities is called an equivalent family if the external potentials of these pairs coincide. The problem arises of construction of such families, both theoretically and on a practical basis. This problem can be solved explicitly in some very simple cases by using the theory of the function of a complex variable and the V. K. Ivanov integral equation for a two-dimensional inverse problem. In this article, on the basis of the theorem of solubility of the inverse potential problem, it is shown that there is an equivalent family "near" any region with an analytical boundary. The demonstration of the theorem has made it possible to develop a method for constructing an equivalent family on the basis of which a program has been developed for an electronic computer. Two numerical examples are given. The algorithm presented here differs greatly from all existing methods in the inverse gravimetric problem and is based on a precise solution of the inverse problem. Figures 2; references: 13 Russian.
[135-5303]

UDC 550.837.6

USE OF A MICROCOMPUTER FOR INTERPRETING FREQUENCY ELECTROMAGNETIC SOUNDING CURVES

Moscow IZVESTIYA AKADEMII NAUK SSSR: FIZIKA ZEMLI in Russian No 3, Mar 81
pp 106-109

IVANOV, A. P. and FEDOROVA, A. V., Institute of Physics of the Earth,
manuscript received 2 Nov 79

[Abstract] The interpretation of frequency electromagnetic sounding curves is a complex and time-consuming task. Its solution requires the availability of a large set of curves and also different nomograms prepared on the basis of the study of the behavior of these curves. In the interpretation use is also made of different analytical expressions usually relating the coordinates of the extremal points of the frequency electromagnetic sounding curves with the main parameters of the section. Accordingly, at present three interpretation methods are in use: grid, graphic and analytical. The use of electronic computers in the interpretation of frequency electromagnetic sounding curves considerably simplifies solution of this problem and greatly reduces the time necessary for the analysis, as is especially important in the interpretation of a great number of curves of different types directly in the course of field investigations. With such a formulation of the problem it is best to use microcomputers having an operational memory volume from 1 to 64 kbyte. The authors used 15-VSM-5 and "Elektronika-60" microcomputers in such investigations. Programs for the interpretation of two-layer curves of the $\rho_2 < \rho_1$ type, two-layer curves of the $\rho_2 = \infty$ type, and three-layer curves of the K and H types have now been prepared for these microcomputers. In the first stage of the investigation in preparing the programs the authors chose the simplest algorithms which could be applied regularly with a limited operational memory of the microcomputer. However, despite such a limitation, in most cases it was possible to achieve entirely satisfactory results. As examples the article gives simple algorithms for interpretation of $\rho_2 = \infty$ curves for the H_z field component prepared on the basis of both the graphic and analytical methods. Figures 3, tables 3; references: 3 Russian.
[135-5303]

PHYSICS OF ATMOSPHERE

UDC 551.521.3:551.510

ROLE OF ABSORPTION OF SUBMICRON FRACTION OF ATMOSPHERIC AEROSOL IN THE TRANSPARENCY WINDOW 8-13μm

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 257, No 2, 1981 pp 319-323

LYUBOVTSEVA, Yu. S., Institute of Physics of the Atmosphere, manuscript received 27 Oct 80

[Abstract] A separate study was made of continual absorption by water vapor and absorption by the submicron fraction of aerosol. Over the continent aerosol was collected under urban (Moscow) and pure natural conditions far from industrial centers -- in the pine forests of Lithuania and in the Abastumani mountains at an elevation of about 2,000 m. Over the oceans (Pacific and Atlantic) some of the samples could be classified as purely oceanic whereas others were taken in a region of densely populated shores with well-developed industry where the influence of the continent and anthropogenic sources of contamination on marine aerosol should be great. With respect to urban aerosol in winter, with a low absolute moisture content, attenuation in the transparency window 8-12μm for the most part is associated with aerosol absorption by the submicron fraction of aerosol. As a result of the selectivity of aerosol absorption, determined by the high content of sulfates in the sample, at the center of the sulfate band (about 9.2μm) α_{aer} exceeds by a factor of 2.4 the absorption by the water vapor continuum; at the edges of the band (about 10.6 μm) α_{aer} and α_{H_2O} are comparable. For natural aerosol under winter conditions aerosol absorption is also comparable with α_{H_2O} in the absorption band $(NH_4)_2SO_4$ and in the region 8μm. The opposite is observed for 10.6μm. In summer high values of the absolute moisture content in the atmospheric surface layer have this effect: α_{H_2O} exceeds α_{aer} in the entire window, including the aerosol absorption band in the region 9.2μm. Over the ocean in the tropics for purely oceanic samples the absorption by the water vapor continuum considerably exceeds α_{aer} in most cases. In the region 10-13μm α_{H_2O} virtually always exceeds or is comparable with α_{aer}; in the region 8-10μm, due to the strong sulfate absorption band, in the IR spectra of particles aerosol absorption can considerably exceed α_{H_2O} (especially during winter). Figures 1, tables 3; references 15: 10 Russian, 5 Western.
[141-5303]

UDC 550.383:550.388.2

EFFECT OF IONOSPHERIC CONDITIONS ON THE MAGNETOSPHERIC PROPAGATION OF SW SIGNALS

Moscow GEOMAGNETIZM I AERONOMIYA in Russian Vol 20, No 6, Nov-Dec 80 pp 1014-1020

BEN'KOVA, N. P., BUKIN, G. V., GOTSAKOVA, L. S., KOLOKOLOV, L. Ye. and SHUBIN, V. N., Institute of Terrestrial Magnetism, Ionosphere and Radio Wave Propagation, Gor'kiy State University and Northeastern Multidiscipline Scientific Research Institute, manuscript received 17 Jul 79

[Abstract] This article is essentially a continuation of earlier studies (G. V. Bukin, GEOMAGNETIZM I AERONOMIYA, 18, 440, 1978; N. P. Ben'kova, et al., GEOMAGNETIZM I AERONOMIYA, 18, 448, 1978; 18, 632, 1978). These studies were devoted to the magnetospheric propagation of SW signals and dealt with several problems related to the influence of ionospheric conditions on the propagation of SW signals between magnetically conjugate points; data on the magnetospheric signal are compared with the state of the ionosphere on the basis of observations by the Khar'kov incoherent scattering measuring complex. This work has now been continued. The tabulated data show that for the range f≈5-15 MHz the distance from the surface transmission point to the emergence of the signal from the ionosphere varies from ~420 to 1,100 km, depending on ionospheric conditions. Accordingly, a signal in this range from the Gor'kiy transmitter emerges from the ionosphere into the magnetosphere approximately at the latitude of the Khar'kov station. In most experiments the signal was propagated during during the morning and evening hours. This is evidence that the most favorable times for the creation of plasma inhomogeneities elongated along the earth's geomagnetic field and guiding SW signals are the periods of predawn and presunset phenomena in the ionosphere. Magnetospheric signals were registered primarily at the times of a sharp imbalance in the illumination of magnetically conjugate regions. The signals were observed at sunrise at altitudes ~150 km in the magnetically conjugate region toward Gor'kiy and ~400 km toward Khar'kov. At these same times the ionosphere at Khar'kov and Gor'kiy was eclipsed to ~800 and ~600 km respectively. These facts agree well with a model of a thermal collisionless wave in the magnetosphere formed by energetic photoelectrons which can create waveguide channels for the propagation of SW waves. Figures 2, tables 3; references 9: 7 Russian, 2 Western.
[131-5303]

UDC 523.72:550.385

POSSIBILITIES OF PREDICTION OF GEOMAGNETIC ACTIVITY FROM OBSERVED SCINTILLATIONS

Moscow GEOMAGNETIZM I AERONOMIYA in Russian Vol 20, No 6, Nov-Dec 80 pp 1124-1125

LOTOVA, N. A. and BLUMS, D. F., Physics Institute USSR Academy of Sciences and Radiophysics Observatory Latvian Academy of Sciences, manuscript received 11 Mar 80

[Abstract] The prediction of geomagnetic activity on the basis of observations of scintillations is based on sounding of those regions of interplanetary space in which the disturbance arrives earlier than at the earth. The possibilities of prediction on the basis of scintillations of radio sources were examined earlier in

an article by O. V. Bol'shakova, et al, GEOMAGNETIZM I AERONOMIYA, 19, 508, 1979, and later by N. A. Lotova, et al., GEOMAGNETIZM I AERONOMIYA, 18, 809, 1978; 19, 788, 1979. The analysis given in the first of these studies was based on data on changes in the effective (averaged along the line of sight) drift velocity of scintillations v_{eff}. The results of study of a more detailed characteristic of the medium $\varphi(v)$ (the distribution function of velocities of inhomogeneities along the line of sight) reveal possibilities of expanding prediction by using more detailed information on the medium -- the shape of the dispersion curves $V(\omega)$, especially in the low-frequency region. The v_{eff} is not sensitive to changes in the contribution of low velocities. The purpose of this new study was to investigate changes in the distribution of velocities along the line of sight $\varphi(v)$, associated with the appearance of an accelerated stream, using available experimental data. The identification of accelerated streams was accomplished by a comparison of values of the parameter b (the slope of the $\varphi(v)$ distribution in the region of low velocities) with the v_{eff} values and the K_p index on the basis of daily data in a long series of observations. The appearance of accelerated streams causes substantial changes in the form of the $\varphi(v)$ distribution in the low-velocity region. It is evidently feasible to make direct use of the change in the form of the dispersion curves $V(\omega)$ for predicting geomagnetic conditions without recourse to preliminary construction of the function $\varphi(v)$. It is also clear that regular observations of scintillations simultaneously at three points, formalized in the form of dispersion curves $V(\omega)$, can be employed directly in predicting geomagnetic activity. The differences in the temporal variation of v_{eff} and b make it possible to hope that the period of prediction of events in circumterrestrial space can be increased in this way by about 1 day. Figures 2; references: 3 Russian.
[131-5303]

UDC 551.510.534

FLUXES OF ULTRAVIOLET RADIATION IN THE LOWER ATMOSPHERE

Moscow IZVESTIYA AKADEMII NAUK SSSR: FIZIKA ATMOSFERY I OKEANA in Russian Vol 17, No 3, Mar 81 pp 323-324

YELANSKIY, N. F., TRUTTSE, Yu. L. and USTINOV, Ye. A., Institute of Physics of the Atmosphere, manuscript received 26 May 79

[Abstract] Numerical modeling of the processes of radiation transfer gives a definite idea concerning the magnitude of radiation fluxes in the spectral region controlled by ozone and their possible variations. However, analysis of the results of model computations frequently reveal considerable discrepancies with experimental data, a result of shortcomings of existing models, such as the imperfection of the numerical scheme for solution of the transfer equation, inadmissible simplifications in describing the processes of attenuation of radiation in the atmosphere and the use of mean values and distributions. This article gives a numerical model in which the indicated shortcomings are manifested to a lesser degree. The radiation fluxes in the spectral region 290-340 nm are computed on the basis of a direct solution of the radiation transfer equation by the spherical harmonics method using a modified numerical scheme in a vertically inhomogeneous cloudless atmosphere. The following factors are taken quite fully into

account: absorption of radiation by ozone, aerosol attenuation, multiple scattering and reflection from the underlying surface. The vertical profiles of ozone and aerosol in the atmosphere correspond to both the mean and extremal conditions. Some results of computations reflecting some tendencies in change of radiation fluxes are given in a table. In the analysis of the results the emphasis is on the characteristics of the vertical distribution of the fluxes of total and scattered radiation under conditions of a pure and turbid atmosphere with different ozone contents. The situations considered correspond to different underlying surfaces whose albedo varies from 0.1 to 0.7. In particular, it is shown that the ratio of the flux of scattered solar radiation to direct radiation in the lower atmosphere in the interval 290-340 nm is very sensitive to a change in the attenuation of radiation by aerosol, which makes this value a convenient index of aerosol contamination of the atmosphere. Tables 1.
[137-5303]

UDC 550.38

POSSIBILITY OF OPERATIONAL SEARCH FOR GEOELECTRIC INHOMOGENEITIES

Moscow GEOMAGNETIZM I AERONOMIYA in Russian Vol 20, No 6, Nov-Dec 80 pp 1084-1089

GENCHIN-ISH, A., FAYNBERG, E. B., SHAPIRO, V. A. and P'YANKOV, V. A., Institute of Terrestrial Magnetism, Ionosphere and Radio Wave Propagation, Ural Scientific Center (Geophysics Institute) and Institute of Physics and Technology Mongolian Academy of Sciences, manuscript received 11 Dec 79

[Abstract] The methods of magnetotelluric and magnetovariation sounding and profiling, based on profile or areal measurements of the components of the natural electromagnetic field, are presently in wide use for studying the electric properties of the earth's crust and upper mantle. A peculiarity of these methods is the need for prolonged observations at each point: from 2-3 days (in reconnaissance investigations) to a month or more (in the case of deep soundings). In many cases the purpose of the investigations is limited to the detection and tracing of geoelectric inhomogeneities near the surface. Such a problem arises, in particular, in detecting different types of tectonic dislocations or in selecting observation points for deep electromagnetic soundings. The authors here demonstrate that in these cases it is possible to dispense with prolonged observations and solve the problem more simply and more productively by means of modular measurements. As illustrated by work in the neighborhood of the Kerchensko-Tananskiy downwarp, an effective method has now been developed for seeking and tracing faults in the earth's crust. Highly productive, it is possible to obtain results under conditions of complex tectonics and can be recommended for use in the first stage of magnetotelluric and magnetovariation investigations for detecting field anomalies and in planning the optimum placement of magnetotelluric stations. Figures 3; references 3: 2 Russian, 1 Western.
[131-5303]

UDC 551.[illegible]

INVESTIGATION OF DISTRIBUTION OF BACKSCATTERING COEFFICIENT IN TROPOSPHERE

Moscow IZVESTIYA AKADEMII NAUK SSSR: FIZIKA ATMOSFERY I OKEANA in Russian
Vol 17, No 3, Mar 81 pp 259-265

IVANOV, A. P., CHAYKOVSKIY, A. P., OSIPENKO, F. P. and [illegible], I. S., Institute of Physics Belorussian Academy of Sciences, manuscript received 29 Oct 79, after revision 5 Feb 80

[Abstract] A study was made of the variability of the backscattering coefficient along horizontal paths, the interrelationship of the backscattering coefficient σ_π and relative humidity f is evaluated, and the influence of slowly changing factors on the interrelationship of σ_π and f is traced. The experimental data used in the study were obtained in an aerial expedition during the autumn over the desert regions of the Kazakh SSR. The backscattering coefficient was measured using an "L-1M" airborne lidar. The latter was a glass (neodymium-activated) laser. This lidar made it possible to carry out measurements at two wavelengths (λ = 0.53 and 1.06 μm; most of the data were obtained at the latter wavelength). The backscattering signal was ascertained from the strength of the backscattering signal arriving from the near zone and therefore the attenuation of radiation along the sounding path could be neglected. In this case the σ_π value was determined unambiguously. The records of σ_π were obtained along horizontal paths with a length of 100-200 km in short time intervals (20-30 minutes). Most of the measurements were at altitudes 500-8000 m. It was found that with an increase in the spatial or temporal observation intervals the change in the concentration and microstructure of aerosol particles acquires increasing importance, this being a factor not directly related to air humidity. With an increase in the time observation intervals there is a tendency to a decrease in the backscattering correlation coefficient. In general, the data show that in small spatial-temporal intervals there was a well-expressed interrelationship between the backscattering coefficient and humidity. However, in contrast to the corresponding interrelationship between the attenuation coefficient and humidity it is quite unstable with an increase in the spatial-temporal observation intervals. Figures 5; references 14: 11 Russian, 3 Western. [137-5303]

UDC 550.388.2

SOME CHARACTERISTICS OF WAVEGUIDE PROPAGATION OF LF WAVES IN THE MAGNETOSPHERE

Moscow GEOMAGNETIZM I AERONOMIYA in Russian Vol 20, No 6, Nov-Dec 80 pp 1021-1027

SEMENOVA, V. I. and TRAKHTENGERTS, V. Yu., Institute of Applied Physics, manuscript received 23 Jul 79

[Abstract] Much experimental data has been accumulated indicating the existence of channels in the earth's ionosphere and magnetosphere in which the propagation of VLF waves occurs. Nevertheless, problems relating to the propagation of VLF waves near the plasmopause have remained virtually unstudied theoretically. Therefore,

In the approximation of geometrical optics, the authors have examined one of the problems related to the propagation of waves in the whistler range at the inner and outer boundaries of the plasmopause; low-frequency waves in the whistler range in slightly inhomogeneous magnetospheric plasma with curvature of the magnetic field. In this formulation, after investigating the influence of slow changes in curvature of the magnetic field and other parameters of the medium along the path on the propagation of whistling modes in magnetospheric channels, it is concluded that the considered series of factors can be important in the generation of ELF and VLF waves in the magnetosphere. In particular, the presence of a channel on the inner boundary of the plasmopause makes that region the most favorable for the generation of ELF and VLF waves, for example, by the cyclotron instability mechanism. On the other hand, however, within the plasmopause itself the effects of signal propagation (instability of group trajectories) impede the effective generation of waves. Figures 3; references 8: 6 Russian, 2 Western.
[131-5303]

ARCTIC AND ANTARCTIC RESEARCH

SOVIET RESEARCH WORK IN THE POLAR REGIONS

Moscow PRAVDA in Russian 9 Mar 81 p 3

[Article by Ye. Tolstikov, HSU, deputy chairman of the USSR State Committee on Hydrometeorology and Environmental Monitoring]

[Text] A quarter-century ago Soviet polar workers undertook investigations of Antarctica. Their results are presented in numerous books and articles and have found reflection in the ATLAS ANTARKTIKI (Atlas of Antarctica), the world's first publication of this type, which has been published in our country. The most persistent "white spot" was erased from the geographical maps of our planet.

During the Tenth Five-Year Plan extensive scientific material on aerometeorology, geophysics, glaciology, oceanology, medicine and other scientific disciplines was collected at the six permanently operating stations. During the past year scientific observations were initiated at a seventh permanently operating station, Russkaya, on the shores of Marie Byrd Land. Reconnaissance investigations covered extensive regions of the Antarctic Ocean, as well as the Antarctic continent. The most significant field investigations on the continent were carried out in the region of the Weddell Sea. The major field base Druzhnaya was created for carrying them out. The system of scientific-operational support of navigation, aviation and expeditionary work was further developed. The collection and processing of synoptic, aerological and satellite information were automated on the basis of electronic computers at Molodezhnaya. The development of methods for long-range meteorological prediction began. The reception of satellite information was organized at Bellinsgauzen station.

The materials of the Soviet Antarctic Expedition served as a basis for the work of more than 20 scientific institutes in the country. They substantially supplemented our ideas concerning the nature of Antarctica.

An analysis of the aerometeorological observations made it possible to detect the patterns of formation and change in the saturation of air with moisture in dependence on different circulatory conditions. In general, Antarctica, constituting about 2.5% of the earth's total area, annually "expends" about 6% of the excess moisture delivered by the world ocean into the atmosphere. It has been established that the heat and moisture arrives on the continent primarily from the direction of Western Antarctica. During the last 20 years an increase in air temperature at the earth's surface has been noted. At the intracontinental stations the warming has been 0.5 degree Celsius, in the region of the Antarctic (Palmer) Peninsula — up to 4 degrees, and on the shores of Eastern Antarctica -- 1.5 degrees.

Using materials from large-scale radar measurements of the thickness of the glacier cover there has been a more reliable determination of the characteristics of the ice sheet. Its volume was found to be $24.9 \cdot 10^6$ cubic kilometers. A total of about 5 kilometers of boreholes was drilled using thermoelectric drills, with continuous removal of an ice core. The use of this drilling method, as well as geophysical and radiochemical methods for the investigation of boreholes and cores, created the prerequisites for the development of paleoclimatic investigations. The first important result of these studies was the conclusion that there was a synchronicity of the principal climatic boundaries of the Holocene period in both of the earth's hemispheres.

Glacioclimatic investigations indicated that in the global climatic system Antarctica is a region of heat loss and due to radiation there is an annual loss of $3.3 \cdot 10^{22}$J of energy.

The study of the marginal zone of the glacier cover of Antarctica made it possible to ascertain the principal features of interaction between the glacier and the ocean and to formulate a genetic classification of the ice shores of Antarctica. It has been established that they are retreating along considerable sectors of the coasts of Eastern Antarctica, including in the Molodezhnaya and Mirnyy regions.

A study of the Antarctic Ocean was carried out under the POLEKS-YuG (Polex-South) program, primarily within the framework of Soviet-American cooperation. As a result it was possible to ascertain the vertical structure of the Antarctic Circumpolar Current. For the first time, on the basis of instrumental measurements, it was possible to evaluate water transport in the system of this current and the principal scales of the temporal variability of currents were determined. A separate volume of the transactions LEDOVYYE PLAVANIYA V VODAKH ANTARKTIKI (Navigation in the Ice in Antarctic Waters) was published on the basis of the results of study of the ice regime of the Antarctic Ocean.

Investigations in the Weddell Sea region revealed the principal characteristics of the geological structure of this region, and in the first approximation it was possible to ascertain the regional structures of the sedimentary cover potentially promising for petroleum and gas.

Three special maps of Antarctica were published during the Ninth Five-Year Plan: geologic (scale 1:5,000,000), metamorphic formations (1:5,000,000) and tectonic (1:10,000,000). Such a series of maps was created for the first time in the history of the geological study of Antarctica. It earned high praise from the international scientific community.

The work of Soviet polar specialists in Antarctica is closely associated with research in the Arctic. Important conclusions were drawn concerning large-scale variations of the hydrometeorological regime in the Arctic, the reasons and mechanisms of their for[illegible], which is of great scientific and practical importance.

In the Tenth Five-Year Plan the prediction of some parameters of sea ice was improved. This was successfully used during the experimental voyages of atomic-powered ships: the "Arktika" -- to the north pole and the "Sibir'" in the course of a high-latitude voyage from west to east. Handbooks were prepared on the natural conditions of the shelf zone of arctic seas. Handbooks appeared on the influence of ice conditions on winter navigation in nonarctic freezing seas (proceeding on the basis of the experience of navigation in the Arctic).

Hydrometeorological investigations in the Arctic have always been characterized by a distinct practical direction. There is not a single branch of the national economy in the Arctic which is unrelated to meteorology. And the more we draw the natural wealth of the North into the national economy, the more economically effective are the results of the meteorological investigations.

Hydrometeorological observations have now made possible a radical change in our ideas concerning the nature of atmospheric circulation in the Arctic in its different regions. It was established that there is a cyclonic circulation throughout the year, attaining a maximum development in winter in the Atlantic and Pacific Ocean regions of the Arctic. In summer it considerably attenuates here. A cyclonic circulation arises, although of a lesser intensity, also in the northern parts of the continents, especially in Siberia, and in the region near the pole. All this predetermines the variability of meteorological elements in winter and its decrease toward summer.

The climate of the Arctic is strongly influenced by the underlying surface. Warm currents, branches of the Gulf Stream, penetrating far to the north and northeast, warm the regions of the Norwegian and Barents Seas, the Spitzbergen and Franz Josef Archipelagos. To a lesser degree, but nevertheless appreciable, there is an influence of the warm current penetrating through Bering Strait into the Chukchi Sea. The cold currents transporting ice into the Arctic basin, especially significantly reduce the air temperature in the northwestern part of the Greenland Sea and to the east of Spitzbergen.

In the central part of the Arctic basin there is a great transfer of water heat to the atmosphere, although this is difficult. Here, in winter, the air temperature on the average is 8-10 degrees higher than in Northeastern Siberia, situated 1,500-2,000 km to the south. During the summer the ocean and the drifting ice even out the influence of the air on temperature. Only over the continent and near it in summer do the meteorological conditions sharply change. In continental regions an enormous role in this case is played by the disturbances dependent on local relief. Exerting an influence on the trajectories of movement of cyclones, for example, they create specific conditions for the distribution of wind, temperature and cloud cover.

The radiation heat influx in the Arctic, having the greatest importance in the heat balance of summer, is subject to considerable fluctuations both in the annual cycle (polar day-polar night) and on an interannual scale. Due to the great transparency of the atmosphere the intensity of direct solar radiation here is 20% greater (with one and the same solar altitudes) than in the temperate latitudes. However, with respect to cloud cover conditions (and it is the principal regulator of the influx of solar radiation and the high reflectivity of snow and ice) the Arctic is characterized by the receipt of a great quantity of heat in the form of scattered radiation. Despite the earlier existing opinion, the high latitudes of the Arctic during the summer receive more radiant energy than the temperate and even the low latitudes.

The results of observations of the transfer and transformation of radiations in the atmosphere are finding more and more use in hydrodynamic schemes of weather forecasting. They are also used extensively in preparing ice forecasts of the opening-up and freezing of the mouth reaches of Siberian rivers.

At the present time all the principal climate-forming factors have been studied and have been evaluated quite correctly.

A network of ozonometric stations has been created and is successfully operating in the Arctic. These stations monitor the state of the "biological shield" of our atmosphere. The investigations made it possible to establish the patterns of change in the ozone content in dependence on the nature of atmospheric circulation and ascertain the possibility of appearance of a biologically dangerous ozone concentration at different altitudes.

During recent years meteorologists have been successfully developing work on an evaluation of the contribution of the polar regions to the global balance of heat, moisture and energy. They are not only of great practical importance, but are necessary for a study of general circulation of the atmosphere and the role of the polar regions in it. The investigations indicated that about 2,000 cubic kilometers of water are annually removed (for the most part with subsequent return) from the world moisture cycle due to the excess of the quantity of precipitation over the evaporation of the Arctic Ocean. However, taking into account the water collection of rivers of the Arctic Ocean, this figure is increased to 8,000 cubic kilometers. The computations made for evaluating the changes in the hydrological regime of the Ob' River as a result of the postulated redistribution of runoff show that the withdrawal of 25 cubic kilometers of water each year will exert no appreciable influence on hydrological cycle processes.

The intensive exploitation of the natural resources of the arctic region is stimulating a further expansion of hydrometeorological investigations in the interests of different branches of the national economy. However, there are a number of major unsolved problems related to the development of methods for predicting weather and climate. Comprehending the hydrometeorological and geophysical processes in the Arctic and Antarctic, we must now make a more detailed study of their role in global atmospheric and geophysical phenomena.

The "Principal Directions" adopted by the 26th CPSU Congress mentions the need for ensuring year-round navigation in the western sector of the Arctic, as well as the timely delivery of freight in the eastern sector. There is a need for a further study of the ocean and shelves, a more rational use of their wealth, improvement of weather forecasts and forecasts of other weather phenomena. In combination with the further study of the polar regions this is very important for comprehending geophysical processes.

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CSO: 1865/129

UDC 639.2.061.3(26

ANTARCTIC WATERS AS AN ARENA OF INTERNATIONAL COOPERATION

Moscow RYBNOYE KHOZYAYSTVO in Russian No 12, Dec 80 pp 25-28

[Article by V. V. Golitsyn, candidate of juridical sciences, USSR Foreign Affairs Ministry, and V. K. Zilanov, USSR Fisheries Ministry]

[Text] A diplomatic conference, finalized with the adoption of a convention on the preservation of the living sea resources of Antarctica, was held during the period 7-20 May 1980 at Canberra (Australia). The conference was attended by 13 countries which are adherents of the consultative conferences called within the framework of the Antarctic Treaty (USSR, Polish People's Republic, United States, Great Britain, Belgium, France, Japan, Argentina, Australia, Norway, New Zealand, Chile and SAR), as well as East and West Germany as countries actively carrying out scientific research and exploiting living resources in the Antarctic region. Invited to the conference as observers were seven international organizations manifesting interest in the living resources of Antarctica, including the Scientific Committee on Study of Antarctica, the FAO, International Whaling Commission and the European Economic Council. During the period 1 August-31 December 1980 the convention on the preservation of living sea resources of Antarctica will be open for signing by states participating in the diplomatic conference. After submission of eight ratification instruments, documents certifying adoption or approval, to the government of Australia, the convention depositary, the convention will enter into force and will be open for the adherence of any state interested in research or fishing activity related to the living sea resources of Antarctica.

The formulation of this convention on the preservation of the living sea resources of Antarctica has marked a new and important stage in the development of international cooperation in the regulation of rational fishing in the world ocean.

The specialized oceanographic expeditions carried out each year during the last 20 years by many countries have accumulated extensive material on the physical characteristics of the Antarctic basin -- its water masses, currents, ice regime, bottom relief, heat exchange, etc., the generalization of which favored an understanding of the structure and dynamics of Antarctic waters and those peculiarities of Antarctic waters which exert a substantial influence on the composition, distribution and magnitude of the living resources of Antarctica. Soviet fishing expeditions rightfully occupy a leading position with respect to both the number and quality of the investigations made in the waters of Antarctica. For example, from 1962 through 1979 more than 100 voyages of reconnaissance and scientific research ships were carried out. The materials of the expeditions have been published by Soviet specialists in more than 350 articles.

As a result of the investigations made an idea was formed concerning the Antarctic basin as one of the most bioproductive regions of the world ocean. The high transparency of Antarctic waters, not subjected to significant contamination, and the long polar day on the average cause a biological productivity of phytoplankton and zooplankton which is seven times greater than in other regions of the world ocean. For example, it is clear, the supplies of krill, one of the most promising objects for exploitation in Antarctica, are estimated by different scientists to fall in the range from 0.8 to 6.0 billion tons, whereas its production is from 0.5 to 1.8 billion tons. Soviet researchers, on the basis of a quantitative determination of krill in the older age groups, conclude that it is safe to take krill in the range from 25 to 60 million tons without inflicting harm on the populations of other species of living resources of Antarctica dependent on it. The reserves of different species of fish in Antarctica, which number about 180 species, are of definite interest for fishing. According to data from foreign investigators, the mean fish productivity of the region is 1.5 tons/km^2. There is a considerable number of some species of pinnipeds.

At the present time the experimental commercial use of the living sea resources of Antarctica has been initiated by the USSR, East Germany, Polish People's Republic, Japan, West Germany, Argentina and other countries. According to FAO data, during the period from 1970 through 1978 the maximum take of fish and other sea products in the waters of Antarctica was attained in 1970 -- 432,000 tons. According to preliminary data, in 1979 the production of living sea resources is estimated at 750,000-800,000 tons. And whereas during the first years of exploitation of living sea resources in Antarctica the main part of the catch was fish, during recent years a considerable part of the catch has been krill. It is precisely the further exploitation of krill reserves on which all the countries carrying out investigations and fishing in Antarctica lay their hopes.

The increasing interest in the living sea resources of Antarctica dictated the drawing up of a convention which would establish an international regime which on a rigorously scientific basis would regulate the further development of the exploitation of sea resources in this region. The noble task of formulating such a convention was taken on by the participants of the consultative conferences called within the framework of the Antarctic Treaty, simultaneously at their ninth meeting in London calling upon all countries to manifest the greatest attentiveness and care prior to the time when the convention became effective in their exploitation of living sea resources in Antarctica so that it would not result in their exhaustion and would not create threats to the antarctic marine ecosystem. The initiative manifested by the participants of the consultative conferences, which according to the Antarctic Treaty have a particular responsibility for preserving the living resources of Antarctica, is a logical consequence of the efforts which they undertook in this direction, among which we should point out the development of consistent measures for the preservation of the fauna and flora of Antarctica, as well as the convention on the preservation of Antarctic seals.

The Soviet Union has taken an active part in preparing the convention on preserving the living sea resources of Antarctica, introducing a number of important constructive proposals. For example, on the proposal of the Soviet Union a section was included in the convention on the creation within its framework of a highly authoritative Scientific Committee to become a center for consultations and cooperation in the field of collection and study of information concerning living Antarctic sea resources.

The convention on the preservation of living sea resources in Antarctica will apply to living resources which are part of the Antarctic ecosystem, and also living to the south of the line of the Antarctic convergence (the line of merging of antarctic and subantarctic waters). According to the convention, living antarctic sea resources include the populations of fish with fins, mollusks, crustaceans and all other living organisms, including birds, which live to the south of the mentioned line. The objective of the convention is to preserve the entire community of living sea organisms in Antarctica and in the solution of problems relating to their rational use obligates all the states exploiting these resources to take into account the possible consequences in the entire ecosystem of Antarctica. In contrast to existing regional international fishing conventions, for the first time in world practice use is made of an ecosystem approach to the control of living sea resources. Exploitation of resources in the region when the convention is effective must be carried out in such a way as to prevent a reduction in the numbers of any population being exploited to limits at which its stable replenishment is not ensured; to reduce to a minimum the danger of changes in the sea ecosystem irreversible in the course of two or three decades.

On the basis of the convention provision is made for establishing a commission with headquarters in Hobart (Australia), a scientific committee and a secretariat. With respect to the commission and secretariat, their functions in general are similar to those which exist for similar organizations operating within the framework of other fishing conventions. A singularity of this convention on preservation of living sea resources in Antarctica is that it includes provision for establishing a highly authoritative scientific committee (which has already been mentioned above), which is one of the principal instrumentalities of the convention. The purposes of the scientific committee include the setting of criteria and methods for the commission to implement resolutions relating to measures for regulating the exploitation of resources, analysis of data on the direct and indirect influence of such exploitation on the population of the living sea resources of Antarctica, evaluation of the consequences of possible changes in exploitation methods for the preservation of living resources, etc.

It should be noted that although the convention on preservation of living sea resources of Antarctica is open for adherence by any interested state, only those states participating in the diplomatic conference in Canberra can be members of the commission and scientific committee, or other states adhering to the convention during the period that they conduct investigations or exploit living sea resources in Antarctica, or regional economic integration organizations adhering to the convention during the time that the states have a right to be members of the commission.

In the commission decisions on problems relating to the preservation and rational use of living sea resources in Antarctica are adopted on the basis of a consensus.

In the convention there is a provision that in order to ensure adherence to its different points the commission will develop a monitoring and inspection system, including a procedure for juridical prosecution of the state flag and the application of sanctions on the basis of evidence obtained as a result of visits to ships by observers and inspectors. The convention on the preservation of the living sea resources of Antarctica confirmed the provision of the Treaty on Antarctica concerning the "freezing" of the question of territorial claims of a number of countries in this region. The Soviet Union, like the United States, is among the countries which do not acknowledge such claims. [Prior to the signing of the Treaty on Antarctica (1959) seven countries (Great Britain, Australia, New Zealand, Argentina, France, Norway and Chile) made claims to territorial sovereignty in Antarctica. The Soviet Union has not made claims to sovereignty in Antarctica and has reserved its point of view with respect to the national ownership of territories discovered by Russian explorers.]

The formulation of the convention on the preservation of the living sea resources of Antarctica by no means transpired smoothly. The capitalist countries, especially the United States, Great Britain and Australia, made strenuous efforts to include in the convention sections which would make difficult or impossible the development of fishing and the exploitation of living sea resources of Antarctica. The idea advanced by the delegations of the United States and Great Britain that that it was necessary to formulate interim measures which would be operative until the convention went into force pursued this same purpose. The essence of these measures was the setting of the maximum admissible catches for different types of living sea resources without any scientific validation. They suggested figures for these catches which were obviously too low. In particular, it was proposed that the maximum annual admissible catch of krill for the coming years be set at only 2 million tons.

These efforts did not receive support among most of the participants in the diplomatic conference. In the final document the conferees called upon the powers having a right to become members of the commission to take all possible measures for the speediest possible adoption of the convention, and also to exercise care in carrying out fishing operations in Antarctica until the convention entered into force and until the scientific committee formulated recommendations on the rational use of the living sea resources of Antarctica.

The importance of the convention on preservation of the living sea resources of Antarctica is not limited to the fact that it creates a mechanism for the formulation of measures necessary in the development of rational fishing in Antarctica and preserving the entire ecosystem for subsequent generations. The convention is an important instrument directed to the further strengthening in this region of an international regime established by the Treaty on Antarctica providing for the use of Antarctica only for peaceful purposes and precluding its transformation into an arena or object of international discord.

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CSO: 1865/144

Il-18D TO ANTARCTICA

Moscow VOZDUSHNYY TRANSPORT in Russian 19 Mar 81 p 4

[Interview with A. M. Kozlovskiy, coordinator of the research project "Organization and Coordination of Scientific Research in Antarctica"]

[Excerpts] We have already reported that on the eve of the opening of the 26th CPSU Congress the Il-18D aircraft returned after having completed the more than 30,000 km journey along the route from Pulkovo to the airstrip at Molodezhnaya station and back to Pulkovo.

[Question] What was special about the last expedition?

[Answer] It was the most significant of all the expeditions equipped for the southern continent. Six scientific research, expeditionary and passenger ships took part in it, as did an aircraft of Moscow's transport department, the GA Il-18D, which completed a flight along the route from Leningrad to the Molodezhnaya station airstrip.

More than 550 participants of the expedition and an equal number of ship and airplane crew members came to the Molodezhnaya, Mirnyy, Vostok, Novolazarevskaya, Bellingshausen, Leningradskaya, Druzhnaya and Russkaya stations. Specialists from the GDR, PNR, Japan and the United States were part of the 25th expedition.

Three Il-14's, two An-2's and three Mi-8's are being used even now. Just as before, a whole complex of loading and unloading work, transport, investigative and search runs were carried out with the help of the aviators.

One of the main events during the 25th expedition, according to the opinion of all the polar workers, was the trial run of the Il-18D aircraft along the route Moscow-Odessa-Cyprus-Aden-Maputo and then to Molodezhnaya station. It became possible due to the snow-ice airport which was built 20 km east of Molodezhnaya station. Thirty hours were needed for the pilots to guide the liner with its passengers from Leningrad to Molodezhnaya station airstrip.

Now passenger flights to the southern continent will become regular. The next flight will occur in October. Incidentally, the question about the more complete use of the aircraft after its arrival in Antarctica has already been considered. In particular, in the course of a week to ten days it could assist significantly in studies of the atmosphere near Molodezhnaya. Possibly such work will be done by the crew during its autumn flight.

CSO: 1865/132-P

WORK OF THE 26TH SOVIET ANTARCTIC EXPEDITION

Moscow VODNYY TRANSPORT in Russian 14 Apr 81 p 4

[Article by E. Kamenev, deputy director of the 26th SAE, candidate of geological-mineral sciences]

[Excerpts] Specialists of the 'Sevmorgeo' Geological-Geophysical Research and Production Association and the Main Administration for Geodesy and Cartography were among the first to complete the prolonged seasonal operations of the 26th Soviet Antarctic Expedition. The dry cargo vessels of the upgraded ice class, 'Kapitan Markov' and 'Pioner Onegi', the passenger vessels 'Bashkiriya' and 'Estoniya' of the Ministry of the Maritime Fleet, and seven Aeroflot air ships of different types were involved in providing the expedition with supplies and provisions.

Despite the very complicated conditions, the entrusted tasks were successfully completed. A number of sections of the scientific program were overfulfilled, in particular, the geophysical measurements made from the diesel-electric vessel, the 'Kapitan Markov', over a large area of the Weddell Sea. For the first time, seismic sections of the upper part of the earth's crust were obtained there. In earnest, we began prospecting in the mountains of the Antarctic peninsula. The field bases 'Geolog' and 'Shel'f' on the Ronne Ice Shelf were located nearby. All of Ronne was aero-magnetically surveyed.

The Il-14 airplane with the number 41808, which had been transformed into a special flying geophysical laboratory, completed a round trip from Druzhnaya to the Dufek mountains and on to the South Pole, then to Patuxent range and back to Druzhnaya. This airplane, for the first time in the history of Soviet aviation, made a landing at the South Pole.

Our scientific landing party, which numbered without counting the ship's crew members about 200 polar workers, collected valuable material on the geology of the Weddell Sea and its mountainous framing.

CSO: 1865/148-P

COMMENT ON NEW ANTARCTIC STATION

Moscow VODNYY TRANSPORT in Russian 19 Mar 81 p 4

[Article by V. Stepanov, commander of "Russkaya" station]

[Text] The seventh, permanent Soviet south polar station was opened under complicated ice and storm conditions by participants of the 25th expedition and the crew of the Murmansk diesel-electric vessel "Gizhiga." The site chosen for it was at the 75th parallel on the ice-free rocky areas of the Burks promontory of the earlier uninhabited Hobbs Coast. The elevation here is 124 meters. On three sides bedrock outcrops are surrounded by a thick continental glacier. The waters of the Antarctic Ocean, filled with drifting icebergs and thick ice floes, almost the entire year, extend in a northward direction.

After having looked forward for a long time and laying the basis for the planned study of the little-known region in the extreme south, we strove to begin quickly implementing the outlined program and to put scientific apparatus and different equipment to use. The harsh test was the polar night, which lasts three months. Formerly there were never any people there during this period. Blizzards raged frequently. Huge snow drifts covered the territory of the station. Storms turned into hurricanes. Wind speeds sometimes reached 35, 45, 58 and 60 m/sec. The freezing weather stayed under -20 and -40 degrees. Calm days were few. It became easier to work only when the sun appeared and daylight hours increased.

Meteorological, actinometric, physiographic, medical, coastal hydrological and ice observations were made regularly. We obtained extensive and valuable data about the peculiarities of the natural processes and phenomena which occur on the Hobbs Coast. Scientists formerly had vague ideas about these processes. Now the curtain of mystery has been raised a little. Collected data, in particular, demonstrate how harsh this part of the ice continent is. Thus, the number of days when the wind speed was more than 30 m/sec was 132.

The new personnel of "Russkaya," led by Candidate of Geographical Sciences L. Bulatov, took over a station with a high rating. Scientific laboratories and pavilions provided with modern instruments, comfortable living quarters and a messroom, a doctor's office, a diesel electric station that makes the research operations, technical and general work possible and a radio station that makes it possible to maintain reliable communications with the main Soviet center "Molodezhnaya" and the mainland are all at the disposal of the scientists and specialists of the Arctic and Antarctic Scientific Research Institute.

CSO: 1865/128-P

OPENING OF NEW ARCTIC STATION

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 11 Apr 81 p 4

[Abstract] By 9 April 1981 four Soviet Arctic polar workers had made camp on a drifting ice floe in the eastern sector of the Arctic Ocean. Three of the polar workers, V. Sergeyev, S. Timofeyev and L. Vavilov, are representatives of Aeroflot. The fourth, G. Mikhaylov, is a radio operator. They will begin preparations for setting up the next Soviet drifting station, "Severnyy Polyus-25." In a few days supplies and equipment that are needed for survival and research will be delivered. The ice floe is moving rapidly. During a 16-hour period the ice field moved 16 km.
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